WESTERN GAS

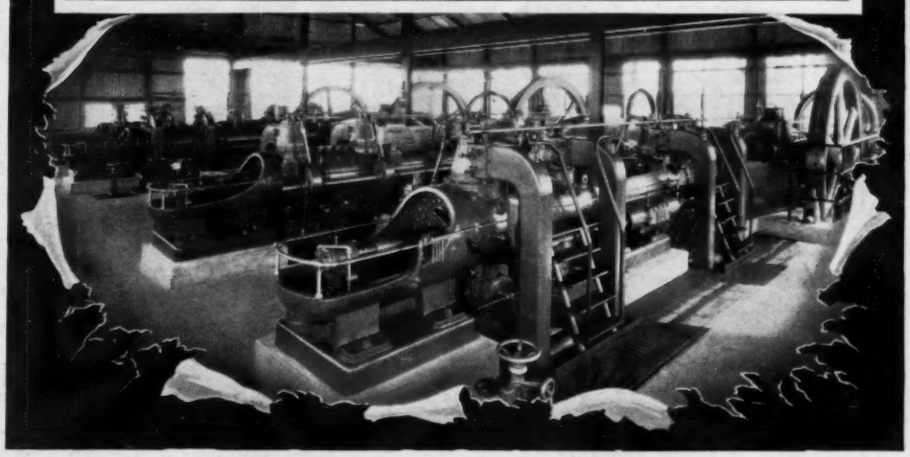
May
1929

20 Cents
the Copy

COOPER

GAS men have been wise enough to pretty generally standardize on Cooper 1000 B. H. P. gas-engine-driven compressors for gas transmission. They have been farsighted enough to refrain from the natural human tendency to use some other type of equipment just to be different. As a consequence there has been enough of this business to permit the Cooper Company to use the most modern machinery, materials and production methods. Details of design have been refined and perfected. Cooper 1000 H. P. engines are carried in stock for immediate shipment. Replace parts are likewise shipped from stock. This is a service and an economy which gas company executives have made possible by standardization.

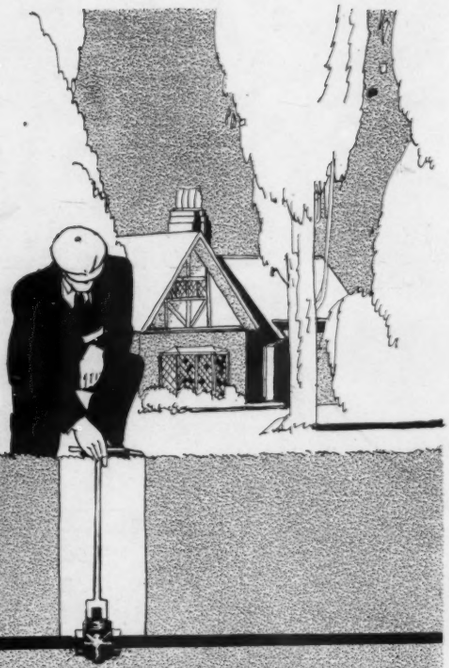
THE COOPER-BESSEMER CORPORATION
MT. VERNON, OHIO GROVE CITY, PA.
630 E. 61st St., Los Angeles, Cal.
1116 Magnolia Bldg., Dallas 615 Kennedy Bldg., Tulsa, Okla.



A MONTHLY JOURNAL DEVOTED TO THE WESTERN GAS & APPLIANCE INDUSTRIES

ANNUAL NATURAL GAS EDITION

Lubricated Service Cocks embodying Nordstrom Principle



now at Moderate Price

The success of Nordstrom Valves in the larger sizes has been so phenomenal that the same principle has been applied to smaller sizes for use on small lines—particularly gas lines in residences and factories where a positive non-leaking valve must be used.

These improved small valves, known as *Nordstrom Service Cocks*, are leak-resistant because of the patented "Sealdport" principle of lubrication which seals the plug by hydraulic pressure. Nordstrom Service Cocks meet the need for a moderately priced valve and are especially recommended for curb and meter service. They are very useful in basements and in interiors of buildings and provide a quick gas shut-off in emergencies and a tight valve on service lines. Made in sizes ranging from ¾" to 1½". Provided in plain and lock wing types.

MERCO
TRADE MARK

"Merco" Lubricant

The lubricant recommended for Nordstrom Service Cocks is made in stick form, ready for convenient insertion, and is compounded of special materials.

Ask for Catalog No. 6 giving full details regarding Nordstrom Service Cocks and Nordstrom Standard Valves.

The genuine Nordstrom pressure lubrication principle is adapted to Service Cocks, for Curb, Meter and Industrial Service.

Merco Nordstrom Valve Company
Subsidiary of The Merrill Company
Engineers - - - - Manufacturers

BOSTON—184 Boylston St.
BUFFALO—Genesee Bldg.
CHICAGO—176 W. Adams St.
DALLAS—Magnolia Bldg.
DETROIT—2842 W. Grand Blvd.
HOUSTON—Petroleum Bldg.
LOS ANGELES—556 S. San Pedro St.
NEW ORLEANS—Masonic Temple Bldg.
NEW YORK—11 W. 42nd St.
PITTSBURGH—Clark Bldg.
SAN FRANCISCO—343 Sansome St.
SEATTLE—Colman Bldg.

Agencies in Principal Cities

FACTORIES: Oakland, California and Belleville, New Jersey
Canadian Manufacturers—PEACOCK BROS., Ltd., Montreal, Que., Cobalt, Ont., Winnipeg, Man., Vancouver, B. C.
ENGLAND—Audley Engineering Co., Ltd., Newport, Shropshire

Nordstrom Service Cocks

THE COMPANIES whose advertisements appear in this Section are exhibiting the latest improvements in equipment and appliances at the NATURAL GAS EXHIBITION, held in Kansas City, May 6th to 9th:

Exhibitor and Representative	*Booth Number*
A-B STOVE COMPANY Herman Jordan, Ross Lynn	100, 101
AMERICAN GAS PRODUCTS CORP. Wm. T. Rasch, C. W. Hazelton, H. H. Dugdale, H. Leigh Whitelaw	59, 60
AMERICAN METER CO. F. H. Payne, John C. Diehl, Garrett B. Linderman, Jr., F. H. Oliphant, E. S. Dickey, W. D. Dickey, R. W. McClenahan, Norton McKean	64, 65, 66, 79, 80, 81
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May, 1929, Volume V, Number 5. WESTERN GAS is published by Western Business Papers, Inc., at 124 West Fourth Street, Los Angeles, California. Subscription price (in advance) 20 cents the copy; $2.00 per year; 3 years $5.00; $3.00 per year foreign. Entered as second class matter June 1, 1925, at the postoffice at Los Angeles, California, under the Act of March 3, 1879.

COOPER AND BESSEMER

UNITED FOR SINGLE PURPOSE

The C. & G. Cooper Company and the Bessemer Gas Engine Company have combined for one, single, primary reason: to offer the Oil and Gas Industry greater service and greater engine values than ever before obtainable at any price.

ELIMINATES DUPLICATION OF EXPENSE

Recently there has been a tendency for the Cooper and Bessemer lines to overlap. Now, by consolidation of companies, this duplication of expense is eliminated. Power users are bound to profit from the resulting economies in manufacturing, engineering and sales costs. Rapid strides will be made in the way of research, engineering, and field service.

COMPANIES MERGED AT HEIGHT

The merger found the Cooper company and the Bessemer company at the high point of their individual business success. Bessemer had just completed its largest month's production in history. Cooper had just secured the largest single order ever placed for gas engines—18,000 horse power.

127 YEARS' COMBINED EXPERIENCE

With Cooper's 96 years of engine-building, and Bessemer's 31 years, The Cooper-Bessemer Corporation inherits a combined experience of 127 years. Cooper has long been the leader in the 4-cycle engine field, especially for service in the natural gas and oil industry. Bessemer has held an equally strong position in the pumping and drilling engine and the 2-cycle compressor

Unite for Greater Service

engine fields—also in the marine and stationary Diesel engine fields.

OWNERSHIP REMAINS THE SAME

The individuals responsible for Cooper and Bessemer success are still the largest shareholders and retain active control. The management of the two companies has been consolidated. Engineering and manufacturing efforts have been unified and standardized. Sales offices are under one man's direct control, but the Cooper and Bessemer sales personnel will be retained.

LINES COMBINED AND STANDARDIZED

Cooper, Bessemer, and Hope engines will be manufactured in standard sizes up to 1500 B. H. P. to meet every condition of service. The combined lines will include small drilling and pumping engines, 2 or 4-cycle compressor engines, vertical or horizontal engines for general power purposes, Diesel oil engines for oil pipe line and electric power generation.

FRIENDLY SERVICE WILL CONTINUE

No matter when you buy your Cooper, Bessemer or Hope—you will get the most advanced, the most reliable, the most economical unit of its type. The same personal contacts, the same friendly service and frankness that built our business will continue. That is our pledge.

THE COOPER-BESSEMER CORPORATION

FORMERLY

The C. & G. Cooper Company and The Bessemer Gas Engine Company

MT. VERNON, OHIO PLANTS GROVE CITY, PENNA.

Welcome! to Kansas City

for

The 1929 Natural Gas Convention

May 6 to 10

Kansas City Gas Co.

Kansas City Missouri

"A Cities Service Company"

This machine applies this $F_c = \frac{Wv^2}{gR}$ formula and makes a cast iron pipe which is 25% stronger

"If you cast molten iron under pressure," said engineers, "the result will be a dense tough metal of great tensile strength." The theory was correct, but high manufacturing costs made its practice seem improbable in the production of cast iron pipe . . . This was before the world had heard of deLavaud cast iron pipe.

In the deLavaud process, the molten metal is fed into a revolving cylindrical mold. Centrifugal force holds the metal against the sides of the mold and drives impurities out *with a force 40 times greater than gravity.* Slag and gas bubbles are driven out of the metal at the center.

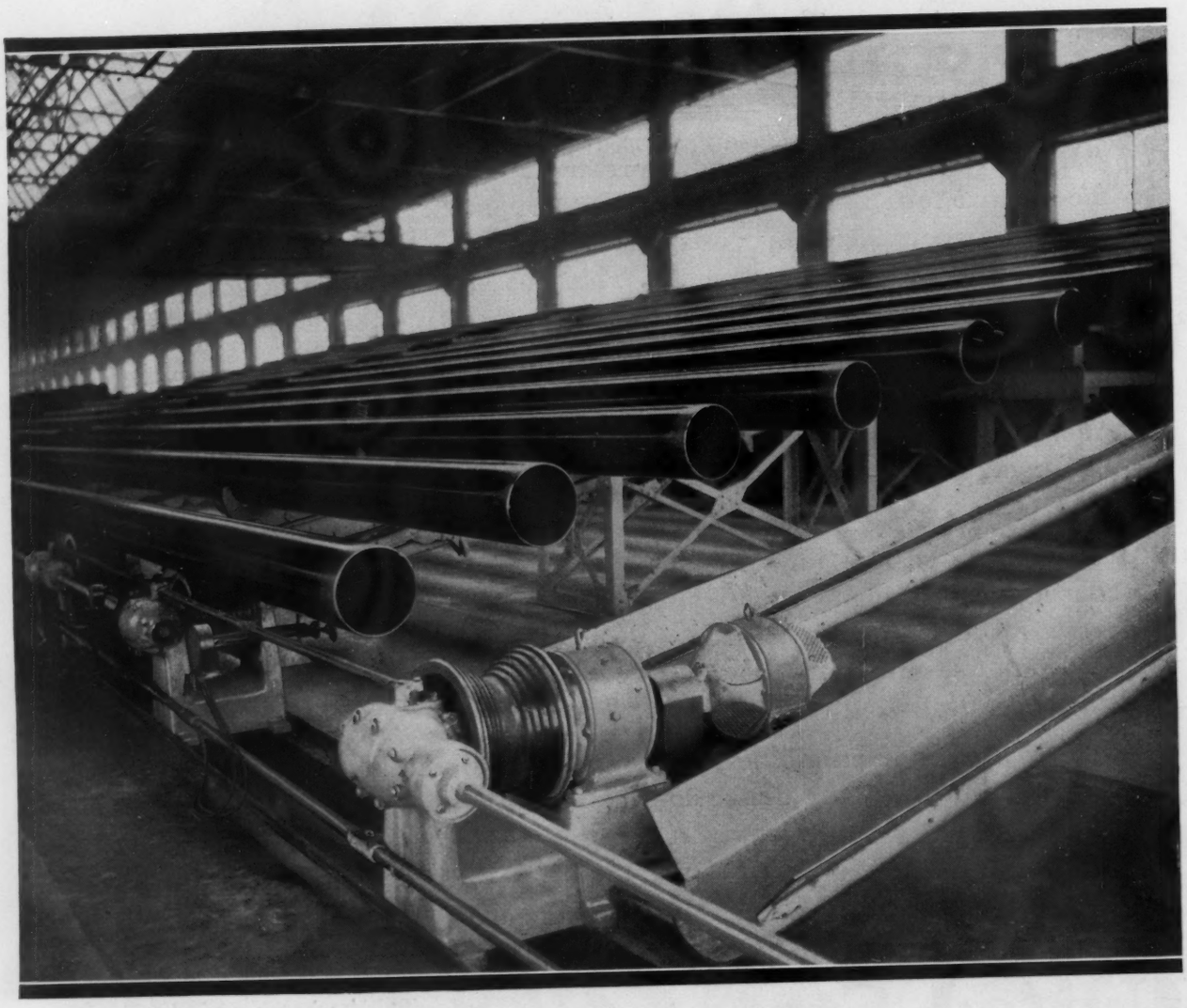
Exhaustive laboratory and factory tests have proved that deLavaud Pipe has a tensile strength of 30,000 lbs. per square inch. Because of its dense, close-grained structure, its freedom from impurities, and high tensile strength, deLavaud is 25% stronger than any other cast iron pipe. This strength permits a thinner pipe for the same outside diameter resulting in greater carrying capacity.

Write for handbook of de Lavaud Pipe which gives a fund of useful information including dimension tables and types of joints.

de Lavaud Pipe
made by
United States Cast Iron Pipe and Foundry Co., Burlington, New Jersey

Sales Offices: Chicago, Philadelphia, Buffalo, Cleveland, New York, San Francisco, Los Angeles, Seattle, Birmingham, Dallas, Kansas City, Pittsburgh, Minneapolis

Capacity is *now*



SMITHWELDED

25 miles per day

The new Pipe Mill of the A. O. Smith Corporation is now in production. Capacity is now 25 miles per day 8⅝ to 26 inch O. D. inclusive, SMITHWelded Oil and Gas Line Pipe.

A. O. SMITH CORPORATION

Oil and Gas Field Products Division

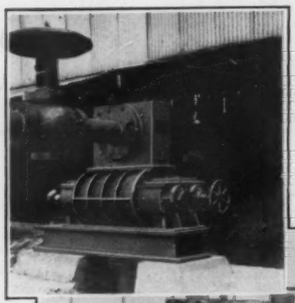
General Offices: MILWAUKEE, WISCONSIN

District offices at: New York • Pittsburgh • Tulsa • Houston • Los Angeles

LINE PIPE

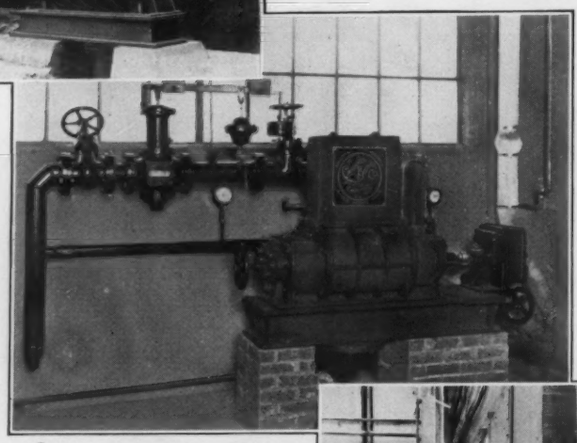
Connersville Meters

are giving dependable readings on industrial and commercial installations

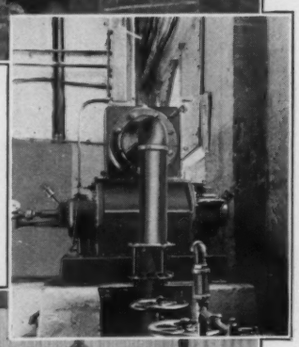


Connersville Meter measuring gas in a steel mill at Birmingham, Alabama. Normal load 20,000 to 40,000 cu. ft. per hour.

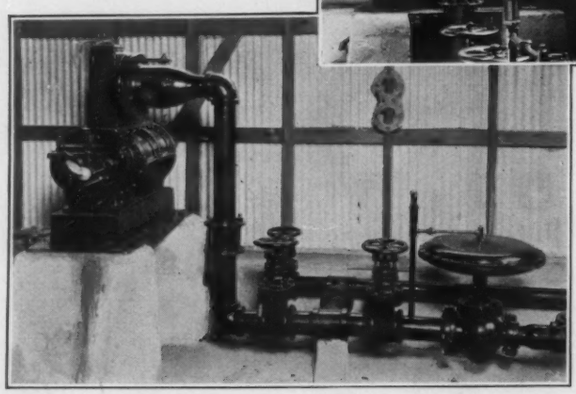
Connersville Meter, installed by Consumers Power Company to meter gas to the Motor Wheel Corporation, Lansing, Michigan.



A 15,000 cu. ft. per hr. Connersville Meter measuring gas to boilers in the natural gas fields.



Another smaller Connersville Meter registering the natural gas consumed under the boilers of a laundry at San Antonio, Texas.



The values that are found in Connersville Meters have already led many gas engineers to recommend the use of them on industrial and commercial installations, in steel mills, metal working factories, in bakeries and other food product plants, on heating installations, etc. These men have found that—

Connersville Meters are accurate, for the displacement is a fixed unchangeable volume.

They are dependable, for all parts are sturdily made from iron or steel, and are not subject to variation.

They are easy to install, a single meter, with its one inlet and one outlet connection can be installed, even for the larger consumers.

They are easy to read, the counter being mounted at a convenient angle, and containing a single set of figures giving a direct reading in cubic feet.

They are easy to maintain in service, as there are no delicate parts to require frequent adjustment.

Bulletin 4D illustrates the reasons for the dependable service of Connersville Meters. It is a new, revised bulletin. Ask for your copy of it.

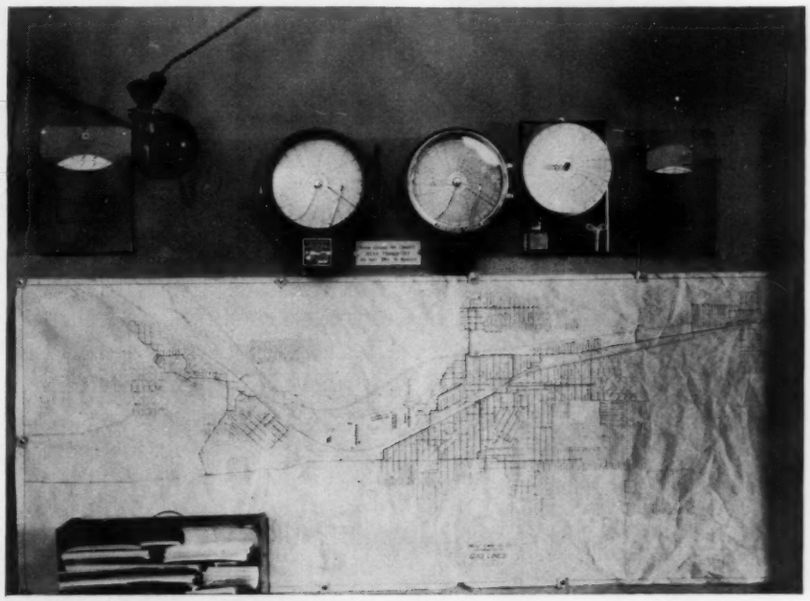
The Connersville Blower Co.

Michigan Ave. at 16th St.
Connersville, Indiana

CONNERSVILLE

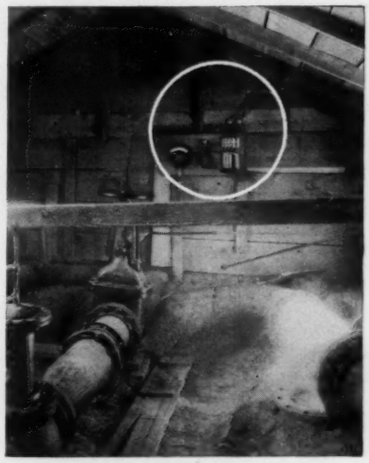
Blowers • Gas Pumps • Meters • Cycloidal Pumps

Simplifies Control of Pressure in the Gas Distribution System



Conditions in all parts of high pressure gas distribution systems can be instantly and accurately checked from the superintendent's office by use of Bristol's Long Distance Transmitting and Recording Equipment.

This Bristol's Equipment consists of two instruments: a transmitter, and receiver (the latter usually a recorder), electrically connected. The transmitter is installed at the point where measurement of pressure is desired and the receiving instrument mounted on wall or panel at central plant, superintendent's office, etc. Can be furnished to operate over a few hundred feet or even several miles.



Transmitting Instrument installed in outlying station on high pressure gas line.

As shown in accompanying illustration for example, the transmitter (in lower illustration) is installed in outlying station and the receiving recorder (above) is conveniently mounted in central office. Such an arrangement permits the superintendent to tell at a glance whether correct pressures are being held. Any change in pressure is immediately recorded on the receiving instrument chart. Should a break occur in high pressure main the record line on the chart indicates not only approximately where, but the exact time at which the break appears, thus facilitating repairs and insuring uninterrupted service.

Instrument at left is the Receiving Recorder, conveniently mounted on wall at central plant.

Likewise Bristol's Long Distance System can be installed to provide a continuous check on intermediate main pressures, efficiency of booster stations, pressures held at end of line, etc.

Complete information about Bristol's Long Distance System, together with prices, etc., contained in Catalog No. 1900. Write today for a copy.

The BRISTOL Company

WATERBURY CONNECTICUT

BRANCH OFFICES

Rialto Building, San Francisco

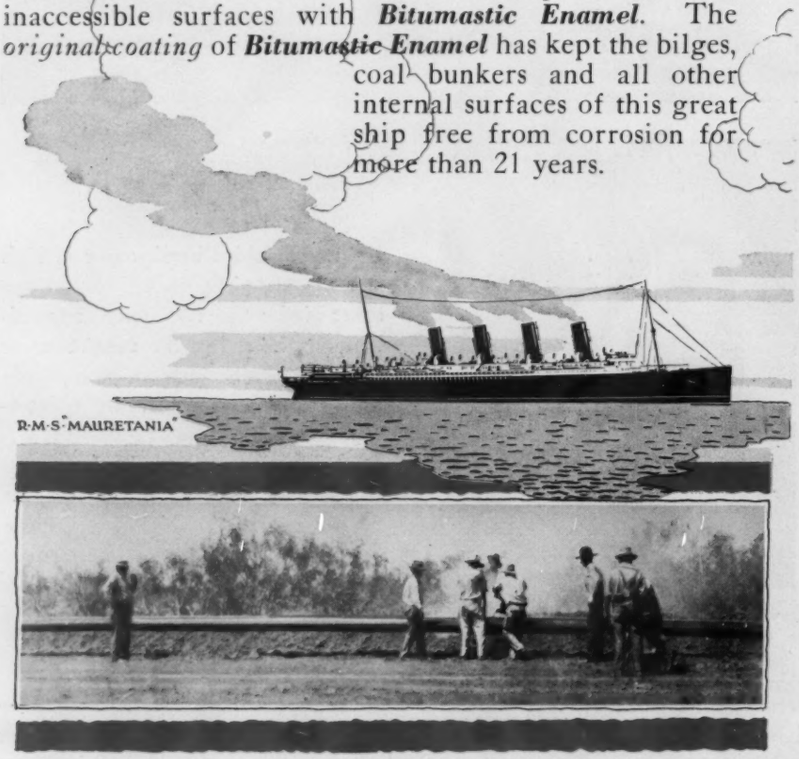
New York Philadelphia Detroit Chicago Denver
Boston Pittsburgh Birmingham St. Louis Akron

A Monument to the Value of Dependable Protection

Twenty-one years ago, on the River Tyne, there was launched a vessel which stands today a monument to the builder's skill and to the value of dependable protective coatings.

This remarkable ship—the "Mauretania"—has not deteriorated with age but progresses serenely from one new conquest to another. Recently, for instance, after more than 20 years of service, she not only created a speed record by traveling 663 miles in one day, but crossed the Atlantic in the amazing time of 5 days, 3 hours and 17 minutes.

The R.M.S. "Mauretania is one of more than 15,000 merchant and naval vessels which have protected their inaccessible surfaces with ***Bitumastic Enamel***. The *original coating* of ***Bitumastic Enamel*** has kept the bilges, coal bunkers and all other internal surfaces of this great ship free from corrosion for more than 21 years.



That ***Bitumastic Enamel*** has been chosen to protect the world's largest gas and oil lines would, in itself, provide no proof were it not that engineers have based their choice on the past performance of ***Bitumastic*** —not only in pipe line but in many other fields. All experience definitely PROVES that ***Bitumastic*** has no equal for the positive long-lived protection of a pipe line. Our book "The Protection of Pipe Lines" summarizes this experience. We will be glad to mail you a copy.

PROOF

PROVEN PROTECTION FOR PIPE LINES

The Memphis Line

A ten million dollar, 18" natural gas line approximately 218 miles long and running between the Monroe Fields in Louisiana and Memphis, Tenn. Protected against corrosion by Bitumastic Enamel.

BITUMASTIC

REG. U.S. PAT. OFF

ENAMEL

Wailes Dove-Hermiston Corporation

17 Battery Place, New York

2464 Enterprise St., Los Angeles, Calif. 345 Vermont St., San Francisco, Calif.

Philadelphia Cleveland Chicago Houston Tulsa San Francisco

MUELLER design
means "an extra margin of satisfactory service"

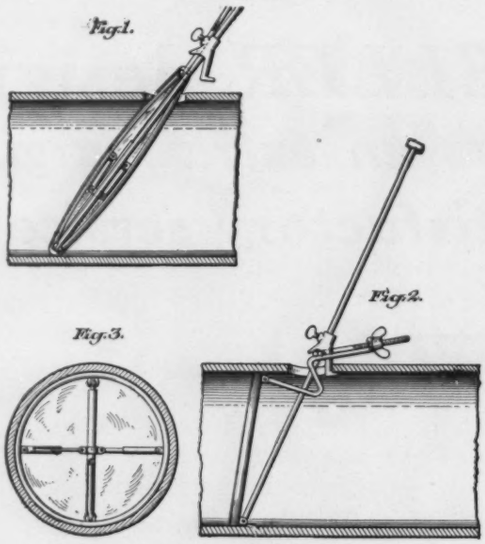
Made to work on the pipe from any angle, Mueller Gas Tapping Machines are designed to give the utmost in results with a minimum of physical effort. The "L" Tapping Machine illustrated is for use on mains 3/8" to 2" inclusive, under pressure.

Because of Mueller's association with this phase of gas utilities since the early beginnings of the industry, Mueller Tapping and Drilling Machines are exceptionally well fitted to the conditions under which they must always be used. The intimate knowledge that such close contact with practical everyday problems has given Mueller designers and workmen is your assurance of **an extra margin of satisfactory service** when you purchase Mueller equipment.

MUELLER CO. (Established 1857) Decatur, Illinois. ***Branches:*** **San Francisco, 1072-76 Howard Street; Los Angeles, 2468 Hunter Street; Dallas, 901 McKinney Avenue.** ***Canadian Factory:*** **MUELLER, Limited, Sarnia.**

MUELLER

A request will bring complete information on the full line of Mueller gas supplies.



Patented and Patents Pending

We will be in Kansas City Booth 88

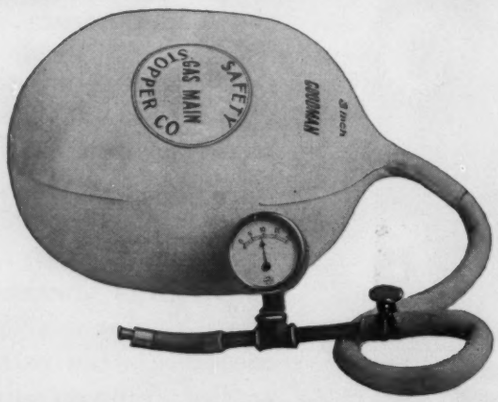
The Goodman Stopper

used since 1897

With improvements from time to time. Now has a Z-handle and cross-bar backing up the diaphragm.

Locking sleeve holds Stopper firmly in place. Look for the name GOODMAN.

Dependable Gas Main Bags



This is our TYPE C—Canvas-covered Gas Main Bag. It is for use in mains heavily coated with tar or oil, and in other places where a plain rubber bag would not hold. It will hold against a higher pressure than the plain rubber bags.

The canvas-cover is treated to withstand the action of oil and this bag is used in oil lines while welding is being done.

Our gas bag valve and gauge combination is shown in use.

Street Department Supplies

Air-Line Masks
Goodman Stoppers
Gas Main Bags
Plugs, all kinds
Blowers
Gauges "U" Type
Pipe-Cleaning Brushes
Quick-deflating valves for gas main bags.
Cylindrical Stoppers
Joint Runners
Mittens and Gloves
Soap Tape and Binding Tape

Safety Gas Main Stopper Co.

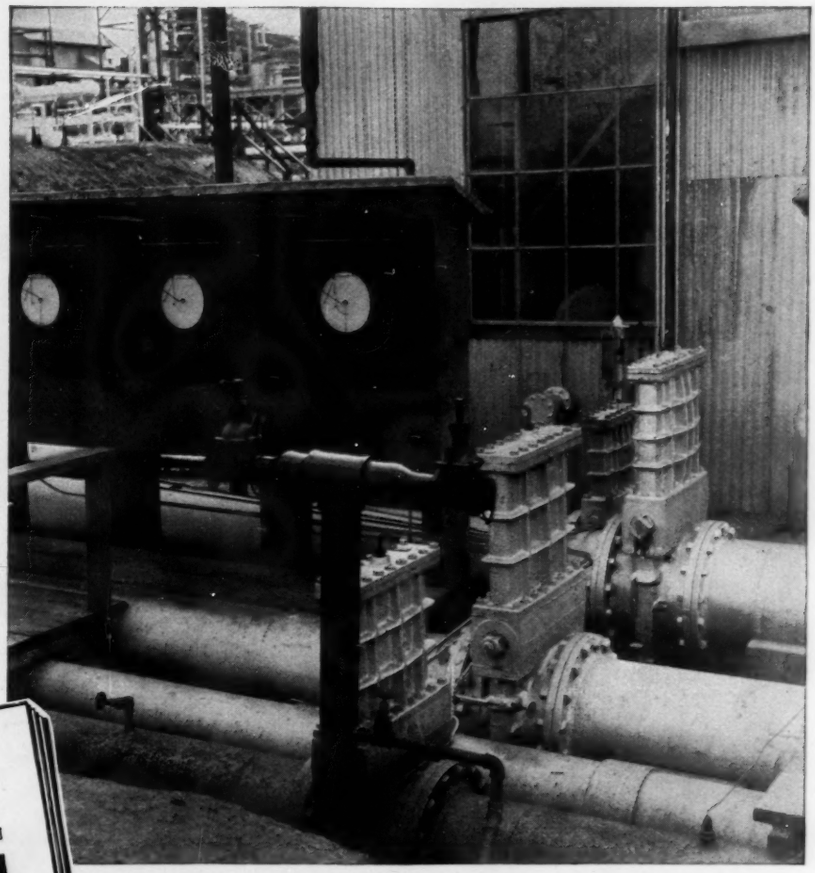
523 Atlantic Avenue **Brooklyn, New York**

Cable Address: Gastopper, N. Y.

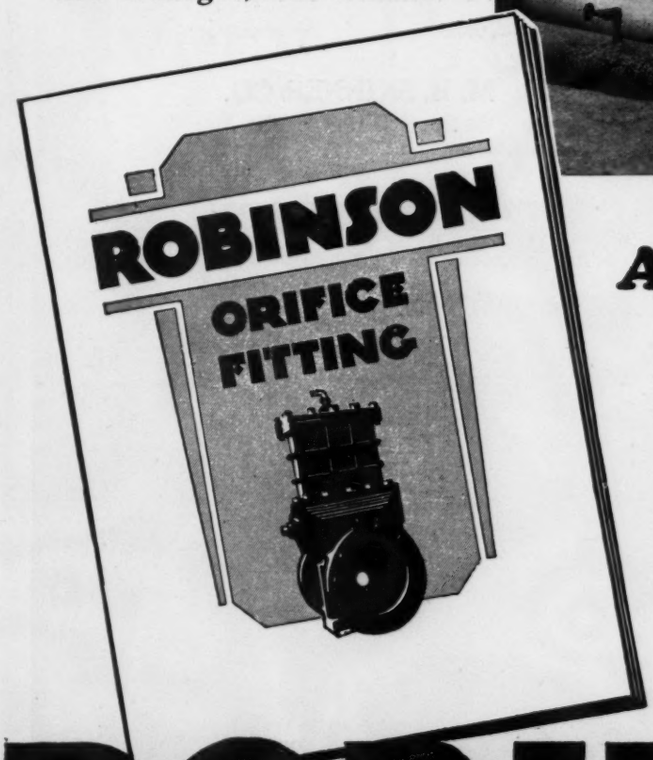
Pacific Coast Representative: C. B. Babcock Company, San Francisco, Calif.

One Way to secure complete details of the purpose, construction and advantages of Robinson Orifice Fittings would be to visit our Booth (No. 212) at the Annual Exhibition, Natural Gas Department, American Gas Association, Kansas City, May 6th to 9th.

Another Plan would be to write, wire or phone us for a copy of our new catalogue, shown below.



These Robinson Fittings eliminate orifice meter by-passes at a California plant



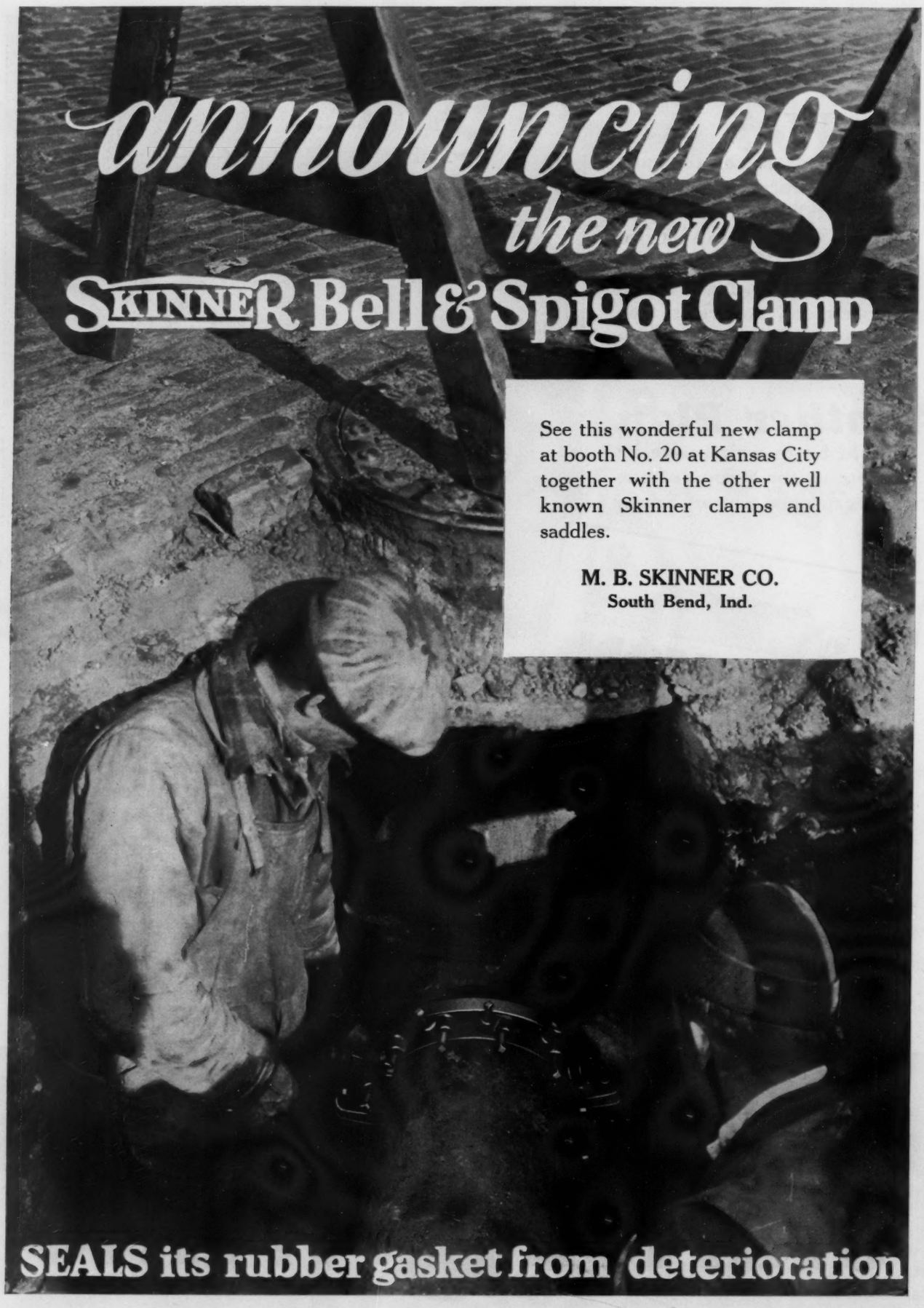
A Third Method and perhaps the best, would be to see an actual installation, talk to the men on the ground, and learn first hand of Robinson merit. You will find these fittings everywhere . . . over 11,500 in use.

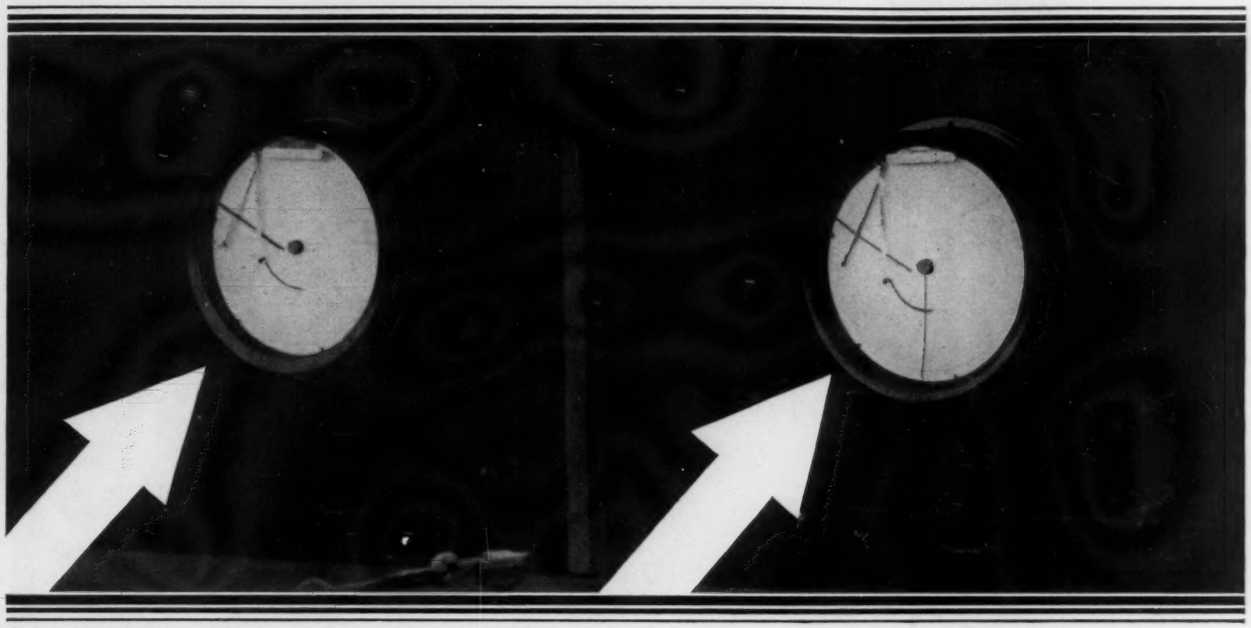
ROBINSON ORIFICE FITTING COMPANY
1435 SANTA FE AVENUE, LOS ANGELES, CALIF.

Distributors
The Foxboro Company . . Westcott & Greis, Inc.

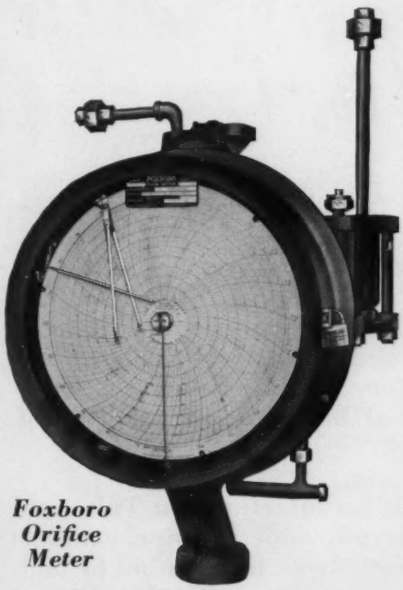
English Distributor
Walker, Crosweller and Company
54-58 Queen Elizabeth Street, London, S. E. 1

ROBINSON ORIFICE FITTING


announcing
the new
SKINNER Bell & Spigot Clamp
See this wonderful new clamp at booth No. 20 at Kansas City together with the other well known Skinner clamps and saddles.
M. B. SKINNER CO.
South Bend, Ind.
SEALS its rubber gasket from deterioration



Every Prediction Fulfilled



Foxboro Orifice Meter

Three standard differential ranges —20, 50 and 100 inches of water. No inherent error—no need for Field Calibration—

Easy to Clean
Uniform Scale Chart
Easy to Zero
Uniform Pen Travel
Easy to Read
Quick to Assemble
Powerful Dirt-Defying Steel Float
Lowest Maintenance Cost
Interchangeable Parts

WE spent years in developing the new Foxboro Orifice Meter. Before offering it to the oil field we subjected it to every possible test of service. It took time . . . but when we finally put this meter on the market we launched it with the prediction that it would break every sales record for flow-measuring instruments.

It did—**and how!** Thousands have been sold in less than two years.

Leading gas and oil engineers everywhere endorse this new Foxboro Orifice Meter as the most accurate, powerful and dependable ever built.

But you don't have to take **their** word for it. You don't have to take **our** word for it. You can prove it yourself . . . easily, quickly . . . by getting in touch with the nearest Foxboro Branch office. Write or wire.

THE FOXBORO COMPANY
Neponset Avenue, Foxboro, Mass., U. S. A.

WESTERN OFFICES
Los Angeles, 443 San Pedro St.
San Francisco, 461 Market St.
Portland, Ore., 816 Lewis Bldg.

New York, Chicago, Philadelphia, Pittsburgh Rochester, N. Y., Detroit, Boston, Atlanta, Tulsa, Cleveland, Dallas, Salt Lake City.

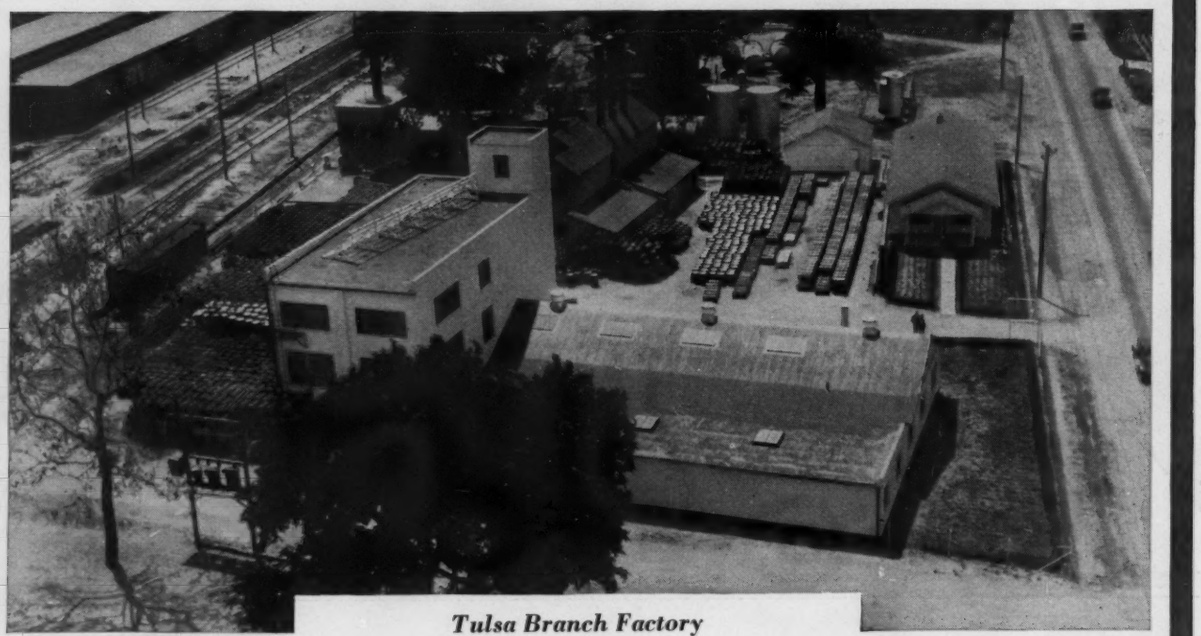
J. E. Treacy, Strada Golesti No. 9 Ploesti, Roumania

Agents east of the Mississippi for Robinson Patented Orifice Flange Fittings.

See our exhibit, American Natural Gas Convention, Kansas City, May 6-9, Booths 69 and 70.

FOXBORO
REG. U. S. PAT. OFF.
THE COMPASS OF INDUSTRY

Instruments for Controlling, Recording and Indicating Temperature, Flow, Humidity and Pressure



Tulsa Branch Factory
Hill, Hubbell & Company

For closer relations with the Oil Industry...

Biturine Pipe Coatings
L & S Portland Cement Paint
Bitulumin
Color Paints
Varnishes
Enamels

More than four years ago the same farsighted policy which was responsible for the rapid growth and expansion of Hill, Hubbell & Company's business on the Pacific Coast in its service to widely varied industries, for all paint requirements, led to the establishment of a branch factory at Tulsa, specializing in oil industry paints and pipe line coatings. During the short period which has followed, the Tulsa branch factory of Hill, Hubbell & Company has manufactured and shipped hundreds of carloads of protective coatings.

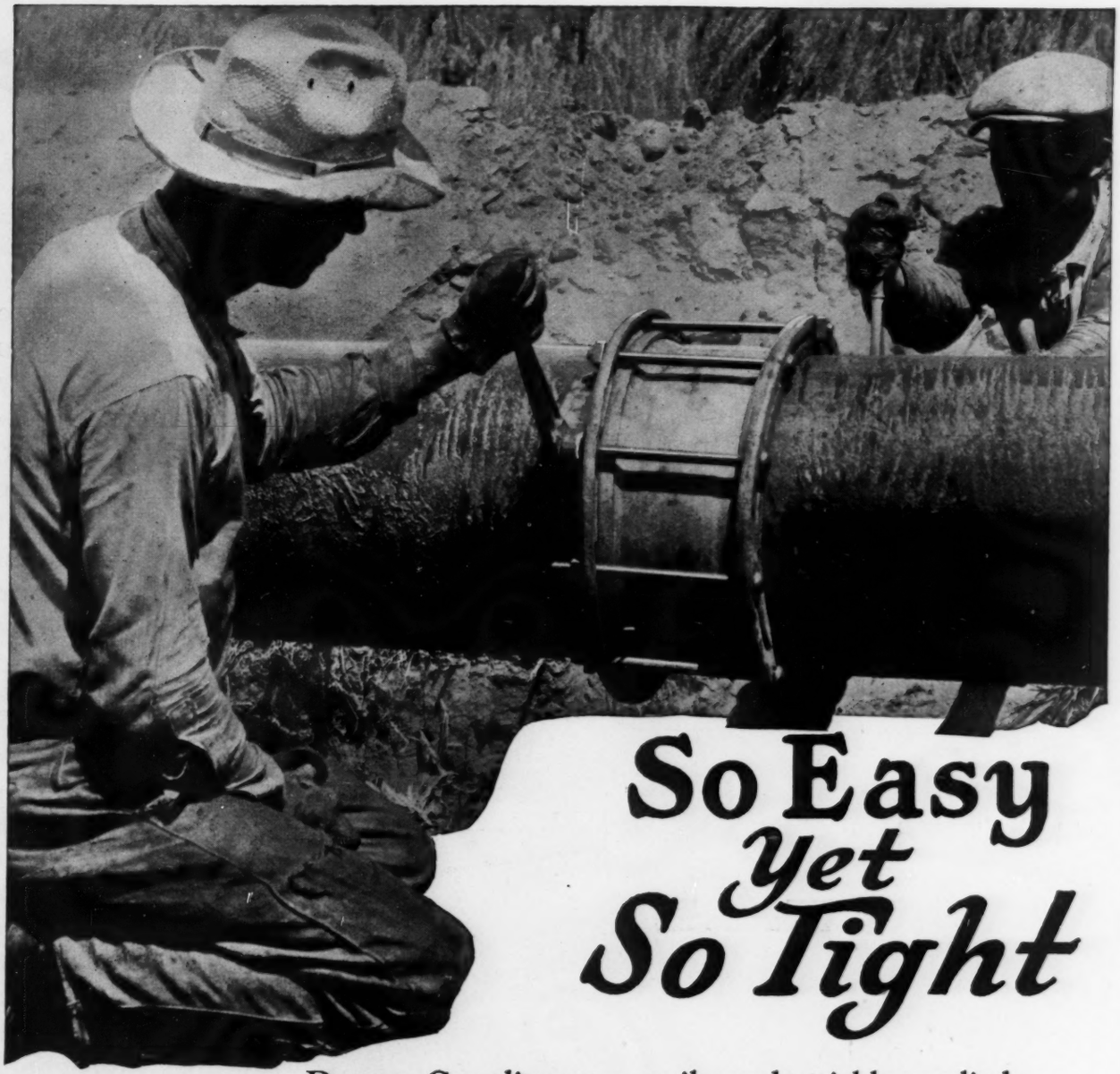
The paint products which have been manufactured in Tulsa and marketed under the Lighthouse Brand, and the pipe coatings under the trade name "Biturine," have made this symbol of high grade, uniform quality famous throughout the Mid-Continent and Southwestern oil fields.

HILL, HUBBELL & COMPANY

Division
General Paint Corporation

Manufacturers of Highest Grade Oil Industry Paints and Pipe Line Coatings
General Offices: SAN FRANCISCO
Mid-Continent Factory: TULSA
Offices:

SAN FRANCISCO - TULSA - NEW YORK - CHICAGO - LOS ANGELES - HOUSTON - PORTLAND - SEATTLE - SPOKANE



So Easy *Yet* So Tight

Dresser Couplings are easily and quickly applied. They take care of expansion and contraction and will remain permanently tight.

S. R. DRESSER MFG. CO., Bradford, Pa.

DRESSER Couplings Dominate

No Heating Job Too Large

A GLANCE at these illustrations makes the versatility of Clow Gasteam heating strikingly apparent. Any place — from the Gulf to the Great Lakes; any job—from a vast movie studio to a tiny suburban station —is a Clow Gasteam job.

No other heating system is so flexible — that's the reason for its versatility. No other heating system can so perfectly and efficiently meet heating requirements. There is no waste heat with this system. Each Clow Gasteam radiator does the job allotted to it — makes comfort-

JAMES B. CLOW & SONS
201-299 N. Talman Ave., Chicago

CLOW GASTEAM

A. G. A. Approved and Underwriters' Laboratories Listed

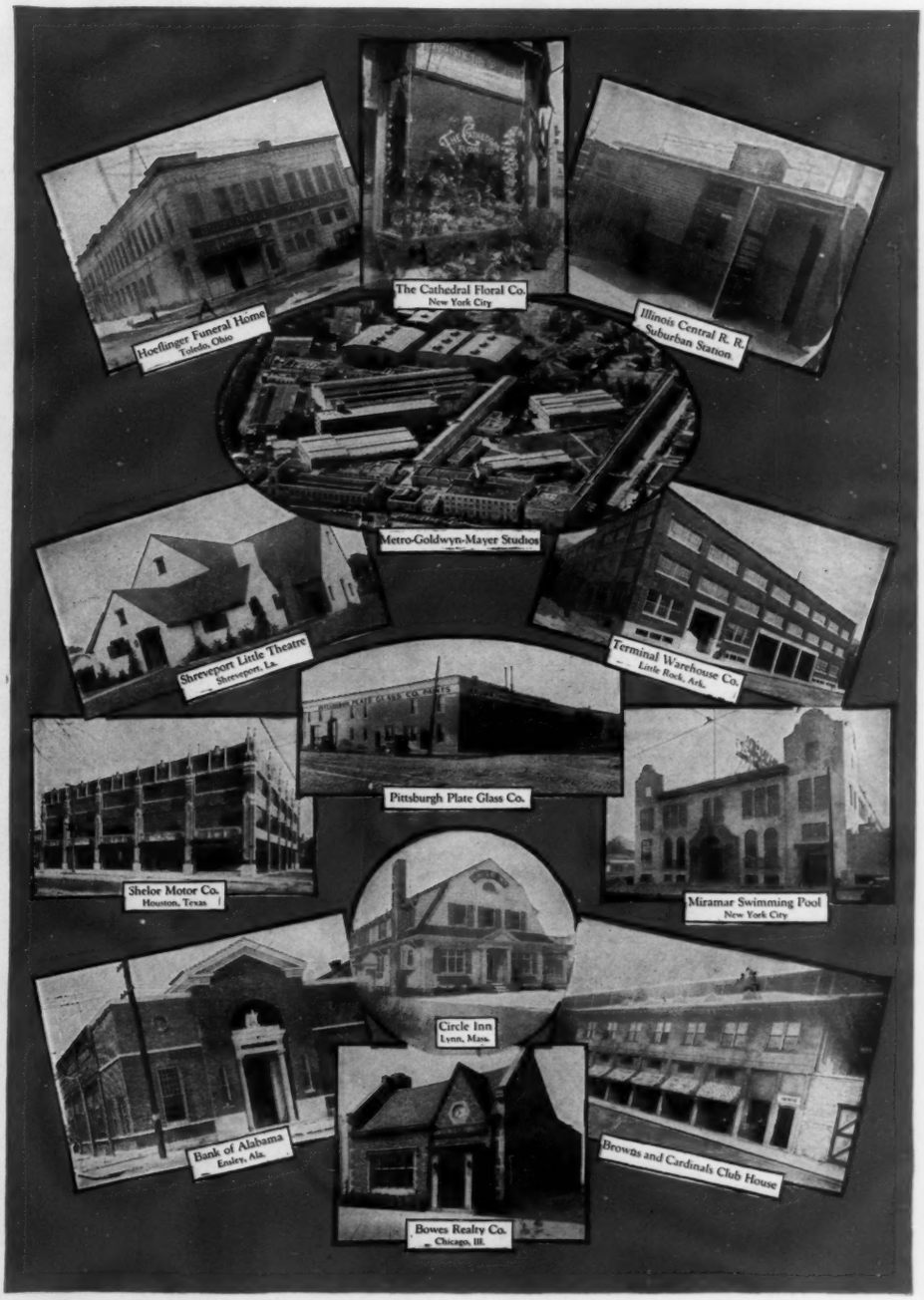
STOCKED IN EVERY SECTION OF THE COUNTRY

—And None Too Small

able, healthful steam heat, when and where it is wanted—no more. One radiator is as easily operated as a thousand —and as efficiently— meeting perfectly the heating needs of any building, at any time.

Clow Gasteam radiators handle dry Texas weather just as efficiently as they perform in Illinois or Massachusetts.

Architects, gas men, heating contractors everywhere are specifying and installing Clow Gasteam more and more. Why not make the most of the possibilities Clow Gasteam has for you?



44 Distributing Points — in all parts of the country

CLOW GASTEAM

A. G. A. Approved and Underwriters' Laboratories Listed

STOCKED IN EVERY SECTION OF THE COUNTRY

What

It Takes More than a Flame and a Casing to Make a Successful Circulating Gas Fired Heater

MOORE'S *Seventeen* PURITAN, the crowning achievement of 39 years experience in manufacturing warm air circulating heaters, is daily proving itself the pre-eminent model of its field.

All that this company has learned about warm air circulating heaters since Originating this better kind of heater in 1891, is built into MOORE'S *Seventeen* PURITAN. Engineering features such as exact balance between air inlets, outlets, and heating unit capacity—precision features such as scientifically designed air passages and perfect fit of all parts—quality features such as rust proof super metal drums and cast iron frame—operating features such as those listed on the right hand page of this announcement—all have their part in making MOORE'S *Seventeen* PURITAN the one outstanding example of complete success in the field of gas fired heaters.

So you know, whenever you install a MOORE'S *Seventeen* PURITAN, that you are making Gas Heat mean to your consumer what it should mean to him; not just heat and a gas bill—but winter comfort so perfect and ideal that the cost is an inconsiderable factor.

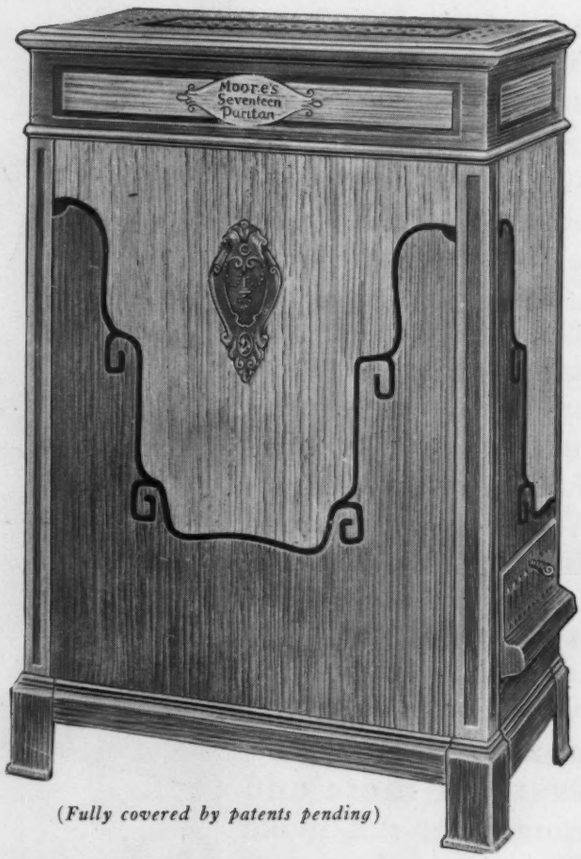
MOORE'S *Seventeen* PURITAN is Safe.

The interlocking of the pilot valve with the main burner valve renders the lighting arrangement practically fool proof.

Each burner has its own pilot light. The pilot is controlled by a valve, the handle of which closes over the main burner valve handle, thus making it impossible to turn on the main burner until the pilot burner has been turned on. Then again the pilot light cannot be turned off until the main burner has been turned off, leaving the pilot always ready for relighting the main burner.

The mica window at the end of each heating unit makes the inspection of the flame an easy matter.

Valves and valve handles are enclosed behind a drop door at the end of the heater which places them out of the reach of children and eliminates the probability of accidental turning of the valves.



(Fully covered by patents pending)

Three sizes—three finishes

MOORE'S *Seventeen* PURITAN is made in a single unit, single burner model; in the standard double unit, two burner size; and in the triple unit, triple burner size for especially large requirements.

All models are available in Mahogany porcelain enamel, two-tone Walnut porcelain enamel and in the plain polished black finish.

The three sizes and three finishes offer a broad range for selection, in heating requirements as well as in matching the furniture settings with a price range in keeping with both.

MOORE'S

does he think?

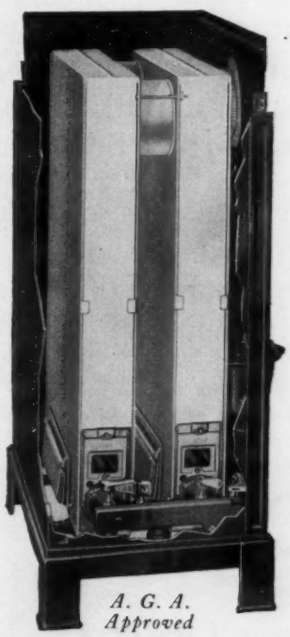
Each Month When You Send Him Your Bill

—and what does she think? If *Good Will* has been built up through MOORE'S *Seventeen* PURITAN, they will be reminded of their emancipation from the old methods of heating from fuels less desirable than gas—they will be warmer prospects for other load building appliances and your securities—they will feel that their Gas Company is more vitally important to their contentment, health and happiness than other commercial institutions in their community.

In short, they can be made to feel that the money they pay for gas brings them more real satisfaction than the same expended otherwise might bring them.

Some appliances serve as well as expected. Others serve so much better that they make their owners *more* appreciative of the Gas Company which urged the purchase. Just such an appliance is MOORE'S *Seventeen* PURITAN Gas Fired Warm Air Circulating Heater. Gas Companies everywhere are finding it the greatest of all *Good Will* Emissaries as well as an exceptionally profitable item of merchandise.

ILLUSTRATING the double-unit PURITAN. Note the location of burner controls.



A. G. A. Approved

Seventeen Reasons Why MOORE'S Seventeen PURITAN is the logical choice of forward looking Utility Companies

1. Designed and built by the *originators* of the warm air circulating heater.
2. Normal rating triple unit 105,000 B.t.u.'s per hour, double unit 70,000 B.t.u.'s per hour, single unit 35,000 B.t.u.'s per hour.
3. Long flue travel and condition of perfect balance between air inlets, outlets and heating unit capacity which assures utmost heat delivery per cubic foot of gas consumption.
4. Keeps all the air in the rooms constantly moving.
5. Accident proof valve handles concealed. Does not scorch or burn rugs or floors.
6. Perfectly adaptable to thermostatic heat control either Robertshaw or Minneapolis.
7. Odorless. Has large vent and down draft diverter.
8. Safe to light because burners light from pilots.
9. Humidity control keeps house perfectly healthful.
10. Made in three sizes and three finishes.
11. Valves, manifold, burners, instantly accessible.
12. Rust resisting inside construction insures long life.
13. Strong cast iron frame insures permanent rigidity.
14. Exterior design truly beautiful in its simplicity.
15. Glossy fused porcelain enamel finish is permanent.
17. Compact, occupies minimum floor space for its great heating and circulating capacity.

Write at once for full particulars of MOORE'S SEVENTEEN *PURITAN and of Moore's Pre-Selling Plan.*

MOORE BROTHERS COMPANY
JOLIET, ILLINOIS—Since 1857

PURITAN

Made to Slam Around.

The Roper 25-82

All this Range expects is plenty of abuse

A range that asks favors of no one is the Roper 25-82. Designed to exactly fit the needs of small restaurants and cafes, it is as sturdy and substantial a range as ever saw a kitchen.

It is of heavy band iron construction with cast iron front and oven door frames. The chef who closes the oven doors with his foot will appreciate the telescope oven door supports. The heavy grate tops over the eight powerful 8 inch star burners are built to stand all the shocks of hurry-up restaurant and cafe work. Two "touch a button" top lighters reach all the burners. The two ovens are heated by four tube burners.

And as the business increases the first 25-82 can be hooked to another unit of the same model or to any other Roper number, to form a battery of ranges suitable for every kitchen requirement.

It can never be told too often when you talk to your prospect; one of the great characteristics of the entire Roper line is economy of operation.

ROPER

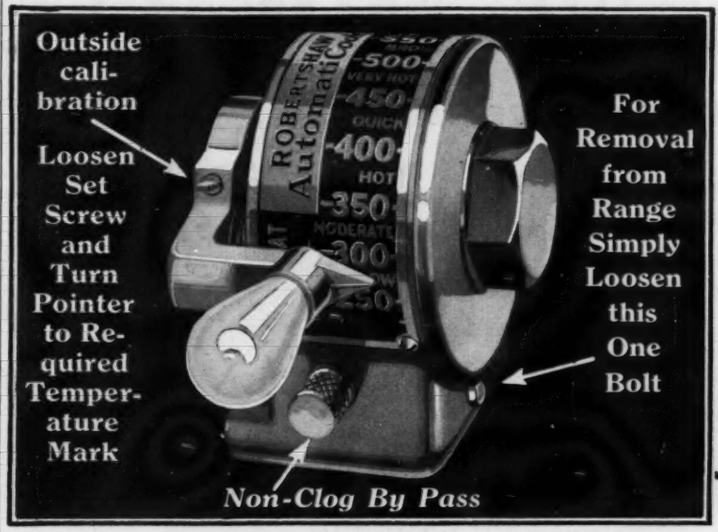
TRADE MARK REG. U.S. PAT. OFF. REG. IN CANADA

GAS RANGES
GAS FURNACES

Geo. D. Roper Corporation, Rockford, Ill.

Pacific Coast Branch
135 Bluxome St., San Francisco

GAS COMPANIES and STOVE DEALERS



Appreciate the Exclusive Advantages of the "B" Type

ROBERTSHAW AutomatiCook

TRADE MARK

Outside Calibration. Takes just a few seconds to change the temperature setting if required, by means of a convenient set-screw on the temperature pointer. Merely loosen the set-screw, move the pointer to the proper temperature mark on the dial, and then tighten the set-screw.

Quick Removal. Should the "B" Type AutomatiCook become damaged for any reason, necessitating replacement, it can be removed without disconnecting the range or disturbing the linings or the piping. Requires no mechanical servicing or repairs on the job. Simply loosen one bolt, replace the Thermostat with a spare and tighten the bolt. The job can be done in less than a minute's time.

Non Clog By-Pass Pilot. Will not clog nor bind. Always moves freely and maintains its adjustment. Eliminates servicing, adjusted by turning either to the right or left.

Non-Corrosive Valve Seat. The AutomatiCook is now being equipped with a Raised Non-Corrosive Valve Seat which will resist the corrosive action of gas, eliminating any possible trouble from this source.

Write for 8-Page Folder, illustrating and describing the above advantageous features.

ROBERTSHAW THERMOSTAT CO.

Youngwood, Penna.

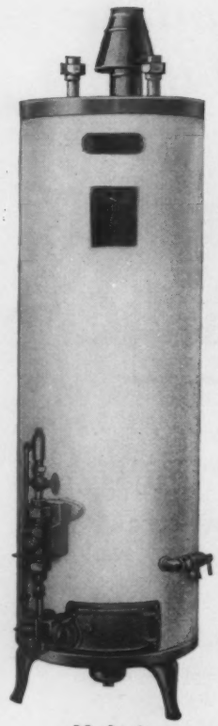
The Robertshaw AutomatiCook is now used on more than 80 leading makes of Gas Ranges

It's Taking the Water Heater Field By Storm

THE PITTSBURG MONARCH

Automatic Storage

WATER HEATER



Made in
2 Sizes
25 and 40
gallon capacity

Low thermostatic temperature operation. Gas Economy.

SUCH unheard of performance of a small storage water heater is the talk of the day. Gas companies, plumbers, and water heater men everywhere marvel at its efficiency.

Extremely Beautiful

THE heater is finished in lustrous enamel. The beauty is excelled only by its performance. Eye value as well as Dollar value.

Built of Quality Materials

THREE hundred pound test copper-bearing steel tank. New Efficient Insulating Material. Safety Pilot.

Combination Safety and drain valve.
High quality workmanship throughout.
Fully Guaranteed.

At a Price that Appeals to all

THE 25-gallon size retails at $95. The 40-gallon size is proportionately higher.

At this remarkable low price for a storage heater that outclasses any other in performance, you will be able to increase your water heater sales beyond your expectations.

Pittsburg Water Heater Co.

478 Sutter St.,
San Francisco

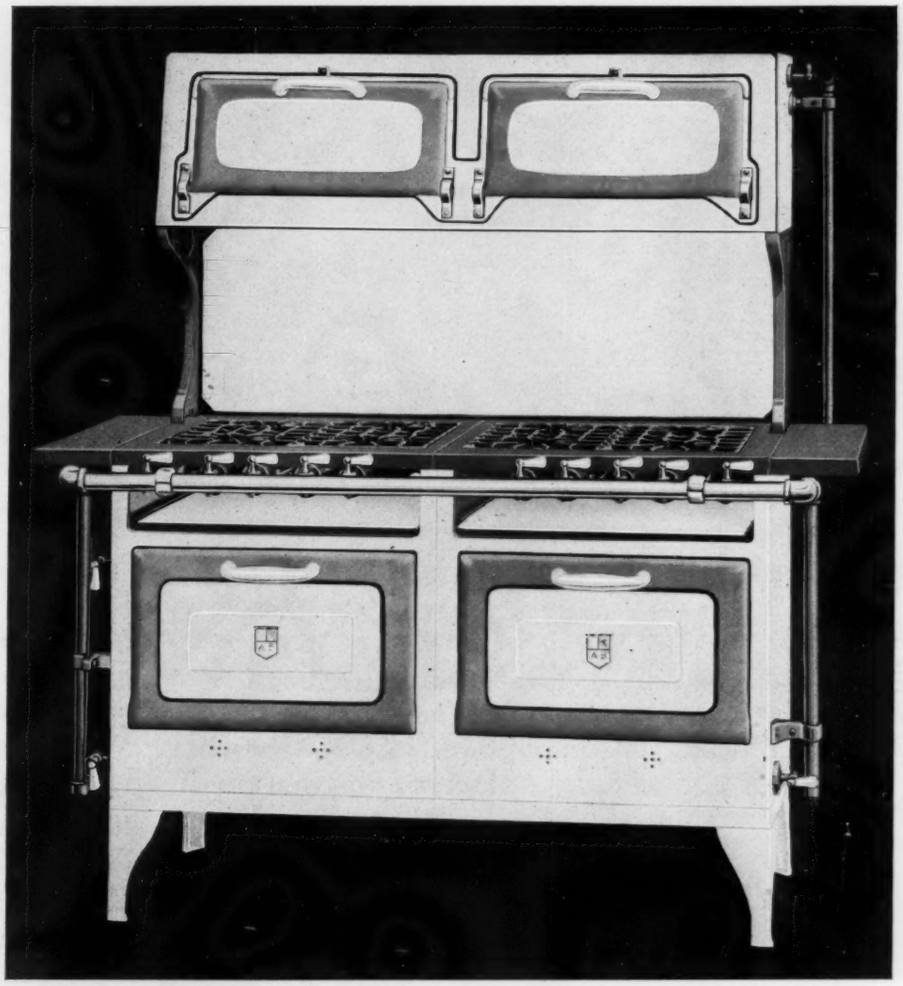
Offices at
2010 Jackson St.,
Dallas, Texas

242 So. Western Ave.,
Los Angeles

See It on Display at Booths 85-86-87

The 1500 Series

A-B Gas Ranges



For Light Duty Club and Cafe Requirements

Comprised of two styles (one with six, the other with eight top burners), each style with two roomy ovens and available in five models, the A-B 1500 Series is especially designed for light duty restaurant, cafe and club requirements.

These ranges are strongly made with fronts and cooking tops of heavy cast iron, finished in ebony black or white and gray vitreous enamel. The 1500 Series are built to give years of satisfactory service. Write for Details — Today!

A-B Stove Company

Battle Creek, Michigan

FASCINATINGLY ORIGINAL

THIS NEW CLARK JEWEL

with compact chrome plated LORAIN RED WHEEL regulator commands a place of distinction in gas range merchandising.

A Heavily Insulated Oven

reduces gas consumption by retaining the heat and helps maintain a moderate temperature in the kitchen while baking.

CORRECTNESS OF DESIGN, NEATNESS OF CONSTRUCTION and EXACTNESS OF OPERATION are features of this modern CLARK JEWEL.

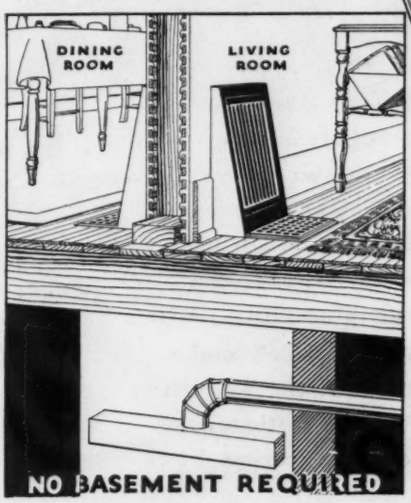
May we point out Sales Plans and Dealer Helps by personal letter.

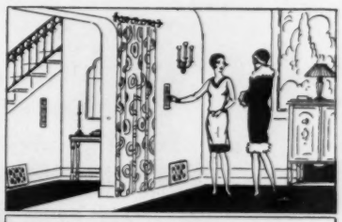
George M. Clark & Company

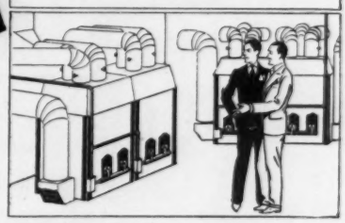
DIVISION AMERICAN STOVE COMPANY

Los Angeles—CHICAGO—San Francisco—New York

3 Popular Leaders *in the* PAYNE HEAT Line







Above—Floor Furnaces.
Left—Wall Type Gas Furnaces.
Right—Unit System Gas Furnaces.

Anticipating Every Residential and Commercial Heating Need

At the Kansas City Convention

Those who attend the Natural Gas Convention in Kansas City, May 6 to 9, will find it worth while to visit the display of Payne Heat equipment. A Payne engineer will be there to explain details of operation and furnish you with any information you may require.

Booths 21-22

THE exacting needs of the architect, builder, contractor and of the heating and ventilating trades are today being met by specially designed Payne Gas Furnaces for both warm and cold climates—for simple one-story bungalows and cottages—for two-story dwellings and pretentious estates—for stores, factories, theatres, hotels, churches and public buildings. Utmost comfort and convenience is provided by Payne Unit Systems. Other Payne Heat equipment includes Floor Furnaces, Central Furnaces, Pipeless Wall Units, Factory Units and Industrial Installations. Write today for new catalog.

PAYNE FURNACE & SUPPLY COMPANY, Inc.

BEVERLY HILLS, CALIFORNIA

PAYNE HEAT

UNIT FURNACES
FLOOR FURNACES
CENTRAL FURNACES
INDUSTRIAL INSTALLATIONS
PIPELESS WALL UNITS
FACTORY UNITS

Payne Engineering Service

Architects, Building Contractors and Heating Engineers are invited to put their troublesome warm air heating problems up to Payne Engineers. Send floor plans and full details of heating requirements. No matter how large or how small your installation may be, the Payne Furnace & Supply Co., Inc., is ready to cooperate with you.

Payne

THERE IS A "PAYNE HEAT" SYSTEM FOR EVERY BUILDING AND CLIMATE

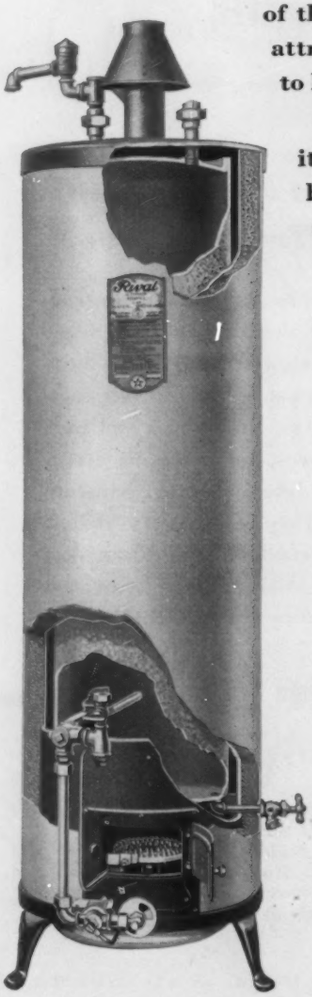
4-1851

Meet the *Rival* at Kansas City

WHILE making the rounds at the Natural Gas Convention this month, don't fail to stop at Booth No. Seven and get acquainted with the Rival Automatic Storage Water Heater.

"See you at Booth No. Seven"

The Rival is a heater of the popular self-contained type. Designed to give genuinely automatic service, and built to last for years, it is yet definitely an inexpensive article. In handling the Rival, you enjoy the advantage of selling a gas water heating system of the most efficient order at a price low enough to attract a large group of customers and high enough to leave room for a handsome margin of profit.



Characteristic features of the Rival which make it outstanding in its price class are: the ¾-inch brass union hot and cold water connections; the double extra heavy welded copper bearing Steel Tank, galvanized with virgin spelter; the Rockwool insulation, 1⅝ inches thick; the three-piece cast iron combustion chamber, made to withstand heat and corrosive action; the Bunsen-type Dual burner; the snap-action thermostat and gas safety patrol valve, which actuate the Rival and give it the safest and most efficient method of gas flow regulation. Each of these is a persuasive selling point.

At Booth No. Seven you can also see the Rex Automatic Storage Heater, as fine a heater as money can buy; the Rex Tank Heater, a standard unit at a popular price; the Rex-Patrol Automatic Water Heater, a low-priced automatic, attachable to any range boiler; and a score of other interesting items. Be sure to visit

Booth No. Seven

The Cleveland Heater Co.

1900 West 112th Street Cleveland, Ohio

The graceful Queen Anne model takes design from an old English fire basket of early days. It is but one example of the fidelity to original type of all Radiantfire Period Models.

Like the work of an Old Master

Every line, every curve, every detail of the period design Humphrey Radiantfire is an authentic expression of the art and architecture of the age which it symbolizes.

Properly selected, with the aid of the intelligent co-operation of the appliance salesman, it becomes an integral part of the beauty and charm of the home it graces.

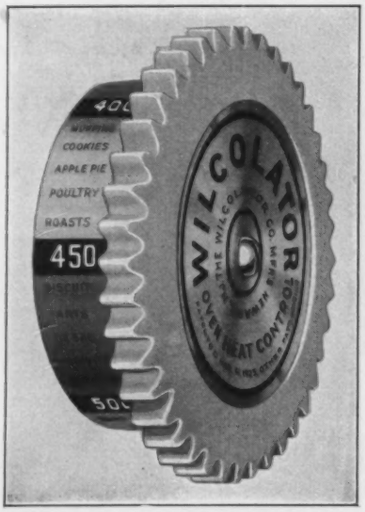
Inherent beauty is ageless, and a period design Radiantfire, once installed, is a permanent guarantee that the fire itself, and the fuel that it burns will never be replaced.

The HUMPHREY

Radiantfire

Pacific Coast Manager
C. B. Babcock
135 Bluxome St.
San Francisco

Manufactured by
General Gas Light Co.
Kalamazoo, Mich.



The 3 features of the Wilcolator which have contributed to its success

Appearance Convenience Efficiency

The APPEARANCE of the Wilcolator Oven Heat Control enhances the eye-value of the range.

The CONVENIENCE of "the cooking chart on the dial," an exclusive Wilcolator feature, has been, in a great measure, responsible for its popularity.

The general design and sturdy construction of the unit is your assurance of the utmost in EFFICIENCY.

The Wilcolator Company

17-23 Nevada Street **Newark, N. J.**

"So Easy!! Just Turn the Valve."

It's a Ray-Glo — The Self-Adjusting Heater

No air mixers or gas controls to fool with, no movable parts to get out of order, and no adjustments to make regardless of the kind of gas or the variation in line pressures. Think what this single Ray-Glo feature means to your consumers in convenience and satisfaction and think what it means to your service department in the decrease of complaints and service calls.

[Every Ray-Glo heater is tested on pressures from 1 ounce to 9 ounces before leaving the factory.]

THE RAY-GLO CORPORATION

BOOTH Nº 310, NATURAL GAS CONVENTION

A new Way . . .

to MAKE PROFITS *from* WASTE SURPLUS

Push use of GAS refrigerator among your customers . . . it builds bigger warm weather load and gives you two profits

NO reason now to let off-season natural gas surplus go entirely to waste. No need for so much costly underground injection. For Electrolux, the GAS refrigerator, builds up your domestic load when you need it most.

Right in warm weather, when consumer demand falls as low as one-fifth of normal, Electrolux works hardest to bring it up to a profitable level. Every Electrolux adds from 1000 to 1500 feet of *extra* billing . . . every month. It's enough to put every domestic account into the profit-making class. Multiply it by a thousand and you've turned a million or more feet of surplus waste into profits.

See Electrolux exhibit at convention... Don't miss the Electrolux exhibit booth. See for yourself how the heat of a tiny gas flame freezes ice cubes and produces intense, even cold, at ideal refrigerating temperature. Note the lack of any moving parts, the complete noiselessness.

It is these exclusive features that sell your customers, and give you two profits, one on the original sale, and the other on the *extra* gas sold every month. Servel Sales, Evansville, Indiana.

YOU CAN BE PROUD to display and sell this refrigerator. Chef model shown above has 7 cubic feet of storage capacity.

Where franchise is open

In certain territories, Electrolux dealer franchises are open at the present time. If you are interested in taking on this profitable load-building line of refrigerators, write or wire today to Servel Sales, Inc., Evansville, Indiana.

ELECTROLUX

THE GAS REFRIGERATOR

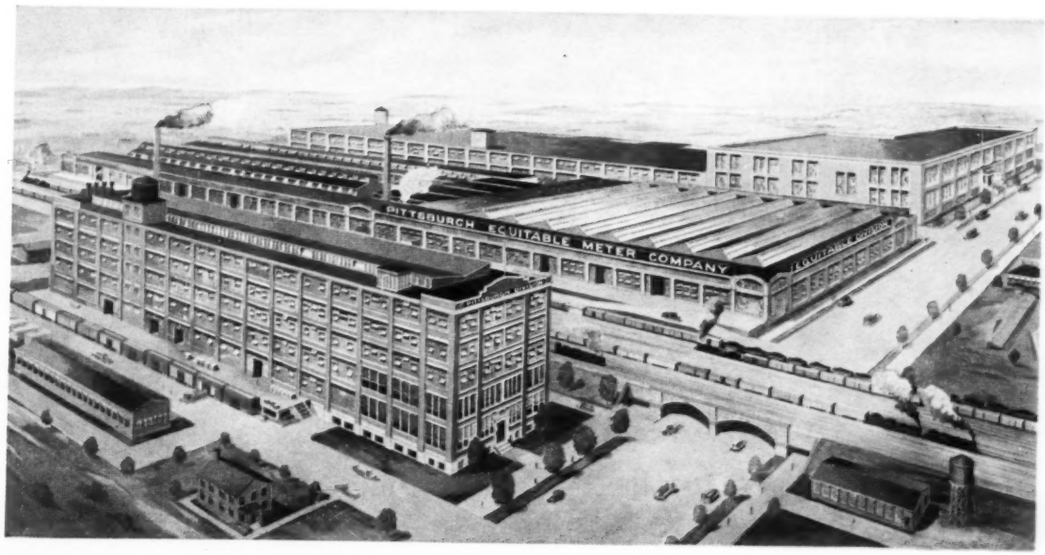
MADE BY SERVEL

Why Electrolux Sells Fast

ELECTROLUX has no machinery at all. There is only a silent, simple system hermetically sealed in one-piece metal unit. It produces a steady cold from the heat of a tiny gas flame. There are no moving parts; no noise or wear.

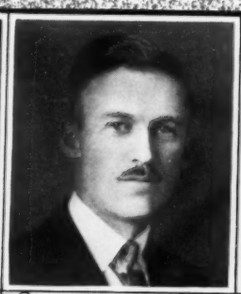
The cabinet itself is made to last a lifetime. It is built of steel and Armco Ingot Iron with pressed cork-board insulation. You can be proud to display and sell this refrigerator. There is a wide size and price range and two color finishes, silver gray and crystal green, besides white. Electrolux sells for $210 to $510 f. o. b. Evansville, Indiana. The special low model (Double Duty) is the right height for the base of a gas range . . . an ideal combination for you to sell.

EMCO — Wherever You Go



MAIN OFFICE AND WORKS — PITTSBURGH, PA.

A. J. KERR
TULSA, OKLA.



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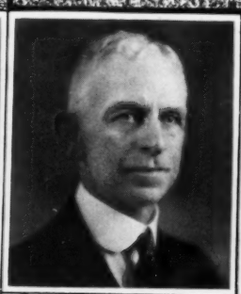

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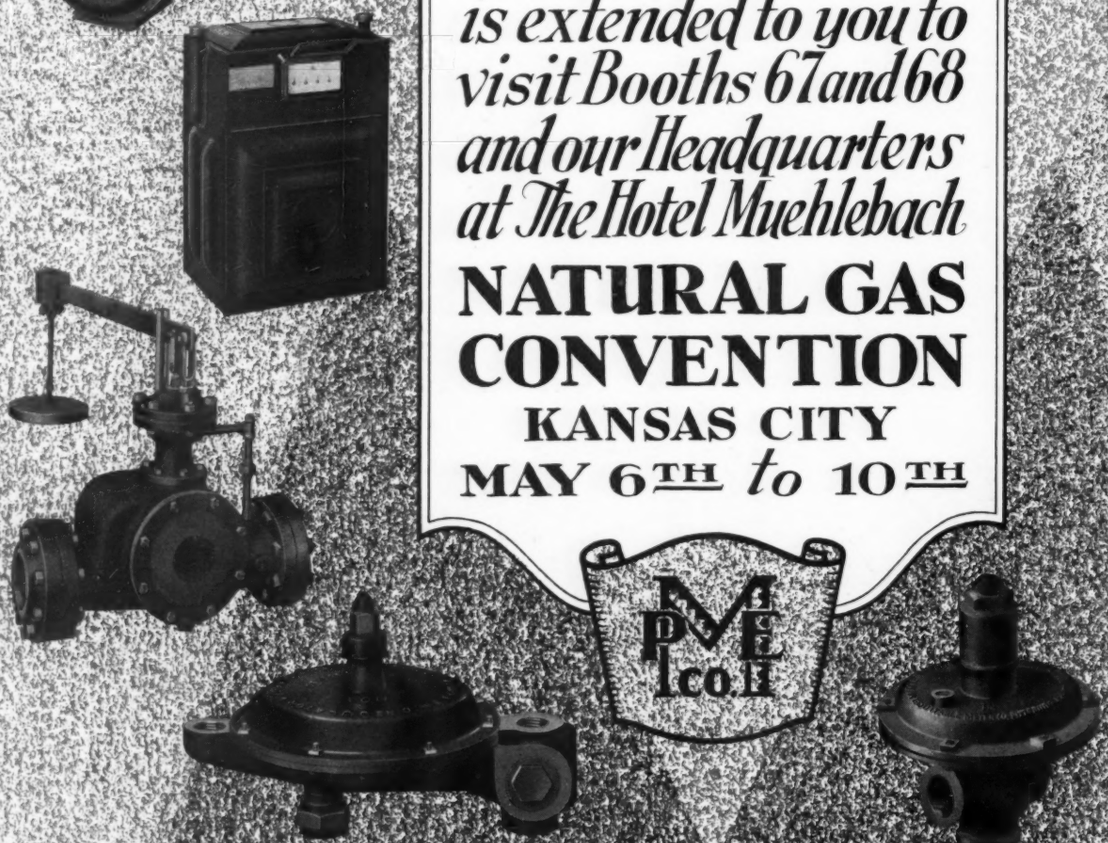
MAY 6TH to 10TH



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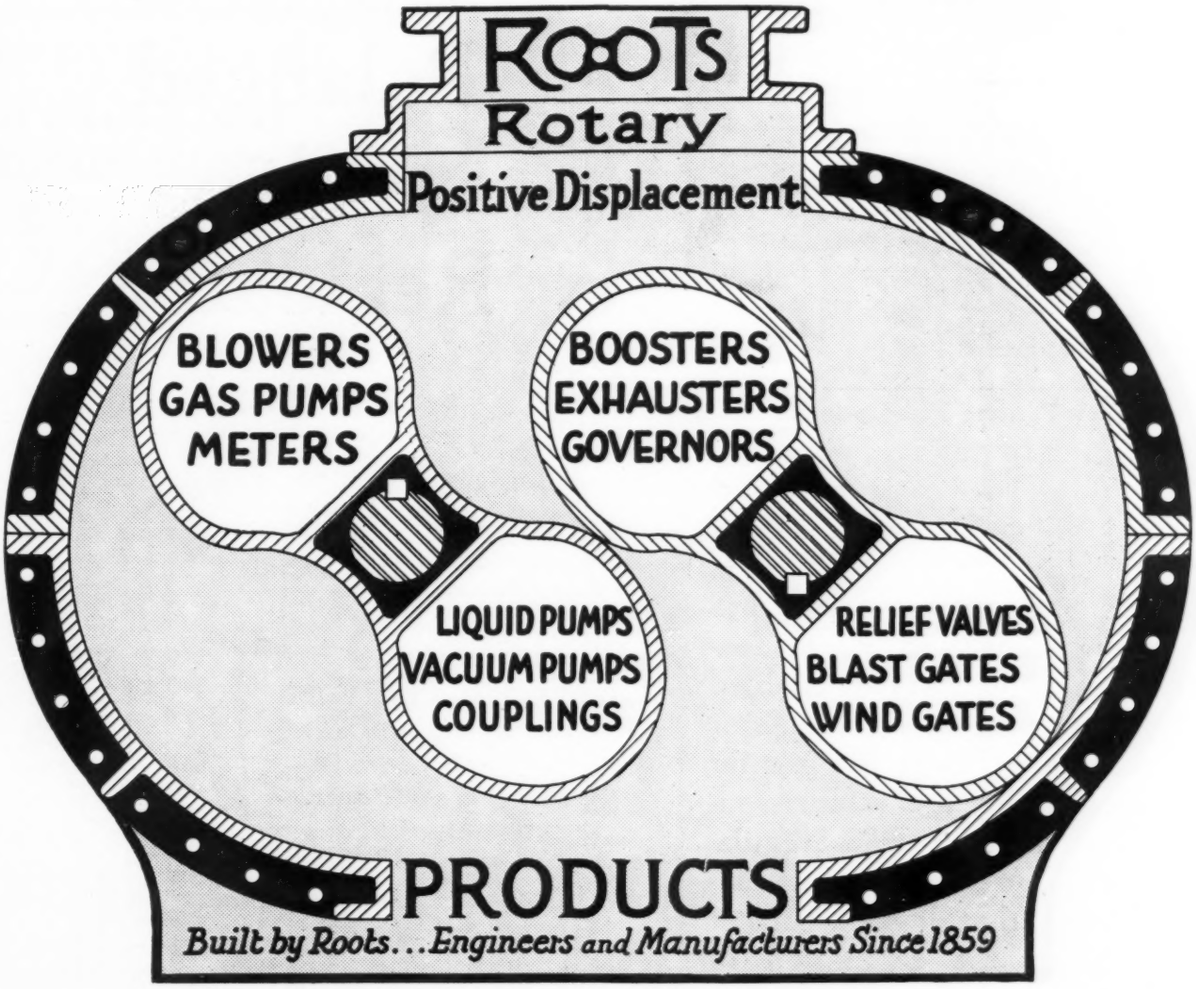
Roots of Connersville



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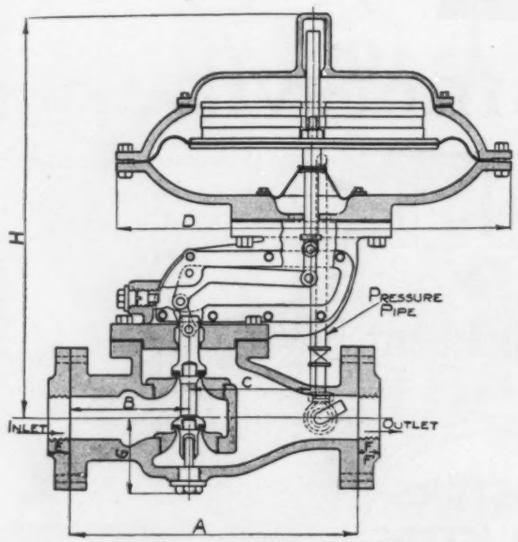

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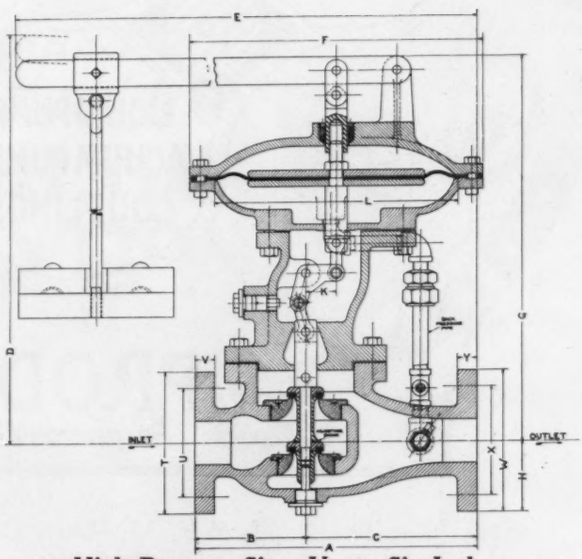
Reliance
Balanced Valve Regulator

This Regulator embodies many new and novel features which have enabled us to produce a regulator with larger capacity, greater accessibility and a more sensitive and accurate regulation. We offer it in full confidence that it will further enhance the reputation of the Reliance Line.



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Bury Them *Anywhere!*
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McEVERLAST protection makes them *Safe*

You can't beat true asphalt for protection against corrosion. Prehistoric relics 50,000 years old have been found perfectly preserved in beds of native asphalt—the same type of material used in McEverlast Protective Coatings. Pipe line covered with this protection can be buried anywhere—and forgotten. Corrosion and electrolysis won't harm them.

LIVE Bermudez asphalt, held in suspension by a special process is the chief constituent of McEverlast Protective Coatings. With a smaller crew you can apply them cold—almost as fast as a man can walk. No danger of burning accidents. In extreme cases a hot coating is sometimes necessary, but usually the standard cold application is enough.

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Special coatings for tanks and other metal surfaces fully described in our booklet, "Protecting Pipe-Lines and Exposed Metal Surfaces with McEverlast Protective Coatings." A request on your letter-head will bring you a copy.

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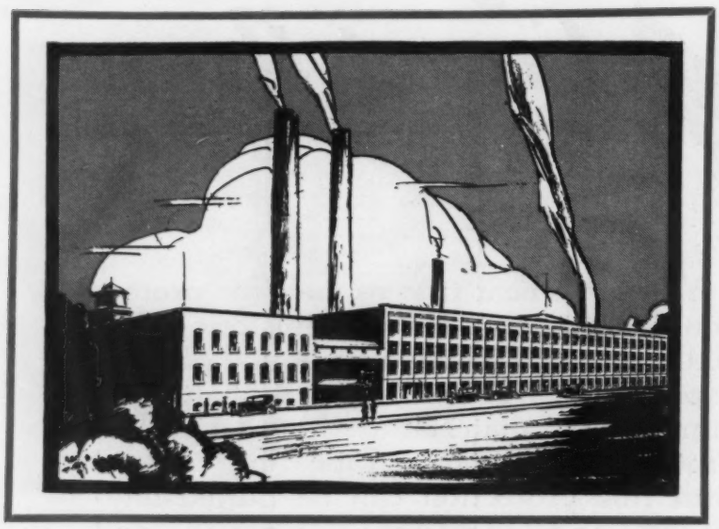

FROM the great factories of the Metric Metal Works of the American Meter Company, from G. M. Davis Regulator Company, Chaplin Fulton Manufacturing Company, Meriam Company, and from D. McDonald & Company, Bristol Company, Taylor Instrument Companies, Crosby Steam Gage & Valve Company, and the Reliance Manufacturing Company, etc.—all of whom we represent—comes dependable and efficient gas industry equipment for our customers.

To Consumer

OUR engineers are at your service, should you desire their counsel and data in choosing equipment for your requirements. This service is rendered entirely without cost to you.

Westcott & Greis, inc.

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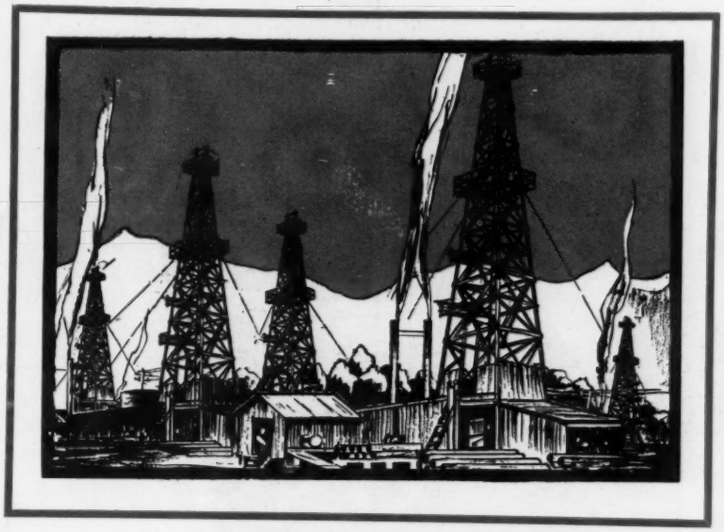
Universal Terminal Wrhse. Co.	HOUSTON

WESTCOT

SALES &

From Field...



OUR line of conservation and safety, and measurement and control, gas industry equipment is complete — from oil well to distributing plant. It includes orifice meters, valve specialties, gas and steam regulating valves, gas regulators, laboratory and testing apparatus, gas plant specialties, recording pressure gauges, "Tycos" instruments, "house type" regulators, etc. Special or standard, if it's in our line, we can furnish it. Write, wire or phone us for complete information.

To Distributors

WE MAINTAIN large and complete stocks so that invariably immediate shipment can be made. We also maintain a service department to keep the equipment we distribute at its highest efficiency.

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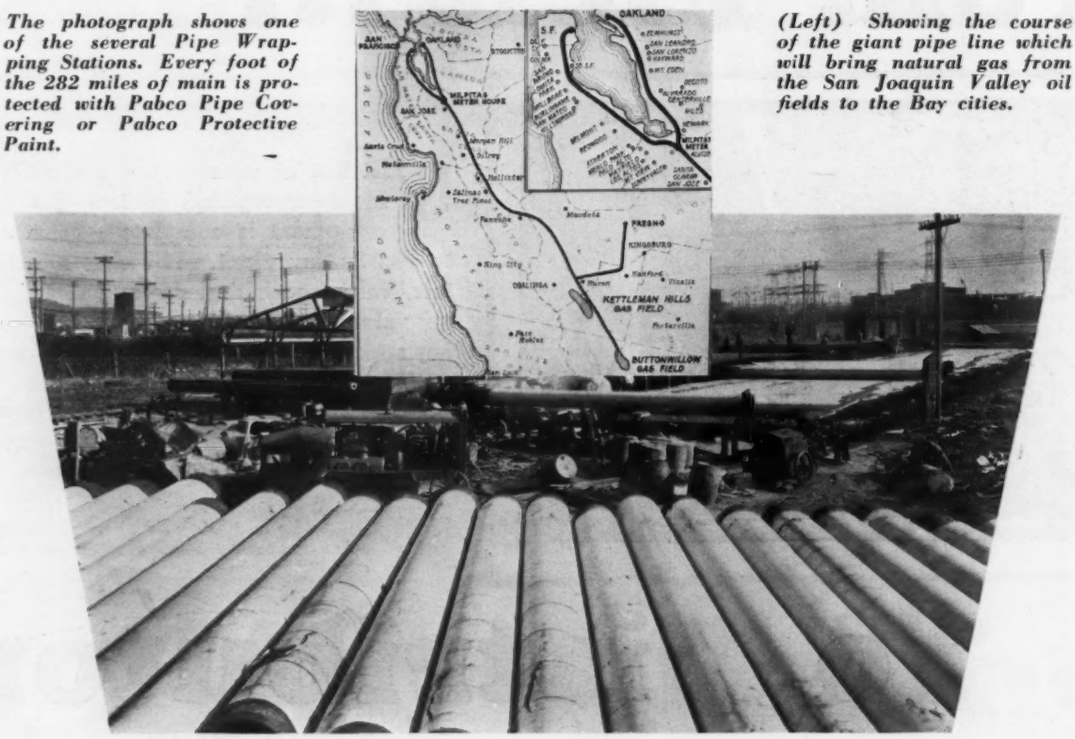
SERVICE

The photograph shows one of the several Pipe Wrapping Stations. Every foot of the 282 miles of main is protected with Pabco Pipe Covering or Pabco Protective Paint.



(Left) Showing the course of the giant pipe line which will bring natural gas from the San Joaquin Valley oil fields to the Bay cities.

282 Miles of PABCO Protection

When the Pacific Gas & Electric Co. decided to make available for consumption in the Bay area the natural gas that was being wasted in the San Joaquin oil fields, they undertook one of the greatest enterprises in Northern California . . . one calling for an investment of over $13,000,000 and the laying of 282 miles of giant mains.

In this connection one of the major problems was that of adequately protecting the pipe against corrosion.

To accomplish this in the most efficient manner, the engineers of the P. G. & E. selected PABCO PRODUCTS.

Whether your pipe protection problem be as large as that of the P. G. & E. or not, you will find the most efficient, most economical and most enduring solution in the use of PABCO PIPE PROTECTIVE SYSTEM.

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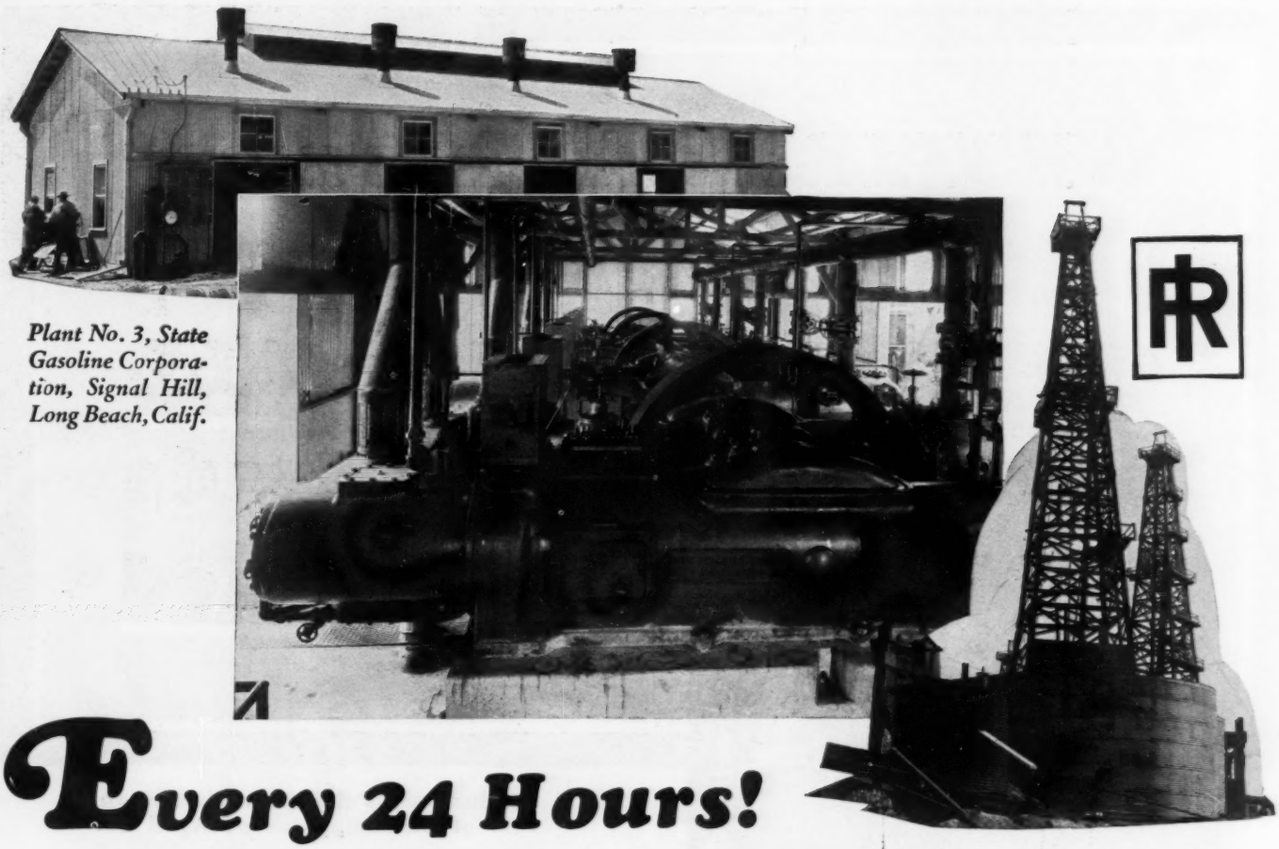

Plant No. 3, State Gasoline Corporation, Signal Hill, Long Beach, Calif.

Every 24 Hours!

. . . this "I-R" four unit plant handles 16,000,000 feet of gas and extracts 30,000 gallons of gasoline!

THIS newest of Signal Hill Compressor plants is equipped with four 18 in. and 18-19 in. and 19 x 20 in. INGERSOLL-RAND Type "XG" Direct Connected Gas-Engine-Driven Compressor units.

Two of the many interesting advantages of this unit are the incorporation of adjustable clearance pockets and valve lifters in the gas compressor cylinders. These features permit the delivery of the rated maximum horsepower through a very wide range of varying intake and discharge pressures without the necessity of shutting the plant down to change cylinders to meet pressure fluctuations.

Another feature is the power cylinders, which are both reversible and interchangeable, permitting either bottom or top exhaust.

The Type "XG" Compressor, being conservatively rated, fills all requirements for a reliable and efficient means of compressing gas.

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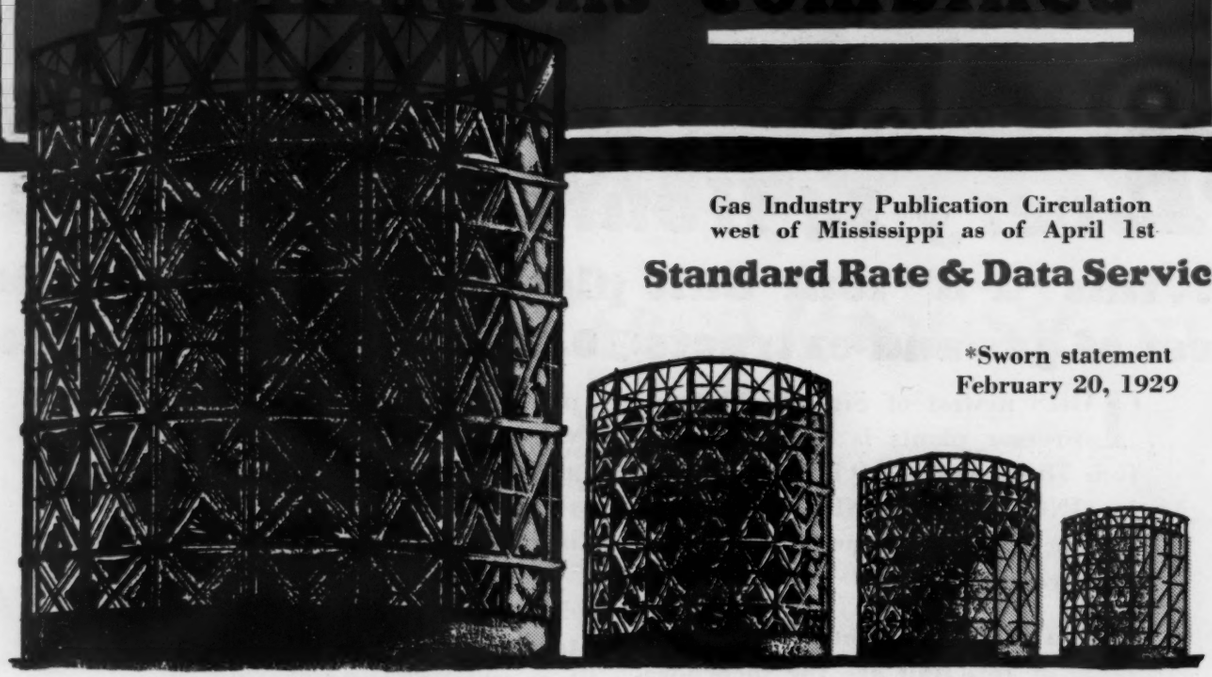
WESTERN GAS has more paid circulation west of the Mississippi than ALL other gas industry trade publications combined



Gas Industry Publication Circulation
west of Mississippi as of April 1st

Standard Rate & Data Service

*Sworn statement
February 20, 1929

WESTERN GAS
2097

Natural Gas	Gas Age-Record	American Gas Jour.
999 *	595	432

NOT only does WESTERN GAS enjoy the great circulation superiority shown above, but its circulation is confined to the area where the gas industry is in its most profitable and extensive development. The big expenditures are being made west of the Mississippi—far reaching natural gas lines, enlarged distribution systems, great merchandizing programs, etc. WESTERN GAS offers its advertisers an opportunity to share in this highly desirable business. And now is the time to start.

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AMERICAN METER COMPANY
JOHN J. GRIFFIN & COMPANY
HELME & McILHENNY
MARYLAND METER WORKS

Published Periodically by
AMERICAN METER COMPANY
INCORPORATED
Established 1836

D. McDONALD & COMPANY
METRIC METAL WORKS
NATHANIEL TUFTS METER WORKS
PACIFIC METER WORKS

VOLUME 1 — *May 1, 1929* — NUMBER 1

In Explanation

Beginning with this introductory number, *Gas Measurement Engineering* will be published from time to time as a record of noteworthy activity relating to gas meters and allied apparatus.

Illustrations and editorial matter alike are planned to be constructively informative, and will be kept strictly within the scope expressed by the title heading of this publication.

Erie Laboratory Described in New Bulletin

THE Laboratory at Metric Metal Works is constantly producing tangible results that are of practical as well as of theoretical value to measurement engineering. A special bulletin, descriptive of the work being done, has, therefore, been made available to the Gas Industry. It is written by John C. Diehl, Gas Engineer in charge of the Laboratory.

Since the subject is too large for detailed presentation in *Gas Measurement Engineering*, we are giving a mere outline of some of the material covered by this booklet.

"The Erie Laboratory, specializing in large volume, high-pressure measurement, was built in 1912 to enclose a 2200-foot holder or prover. This prover was constructed for the purpose of determining the values of orifice coefficients and for testing large-volume positive or proportional meters. Since then a great deal of new equipment has been added for performing more accurate tests and a greater variety of tests. The building has had to be extended from time to time until it now occupies 3500 square feet—all of this space being devoted entirely to experiment and testing. During 1929 the Laboratory will again be substantially enlarged."

The extent of present equipment and activity is indicated by the outline which follows and by three photographs of the laboratory.

(Continued on next page)

A "Best Seller"

Among the Technical Literature of the Gas Industry

Since the first appearance of the revised edition in 1927, the demand for the Natural Gas Handbook compiled and edited by John C. Diehl and published by American Meter Company through Metric Metal Works has exceeded 3,000 copies.

Although this handbook has been the basic reference authority of the Natural Gas Industry since 1913, the revised edition has greatly enhanced its practical and comprehensive usefulness.

This is attested by the widespread and continuous demand for the book from both Natural and Manufactured Gas Engineers. Its present circulation extends to every country in the world where gas plays a part in industrial activity.

A complete prospectus giving a resume of contents of the Natural Gas Handbook is available by request.

Other Technical Literature for sale by Metric Metal Works:

Pressure Extension Book

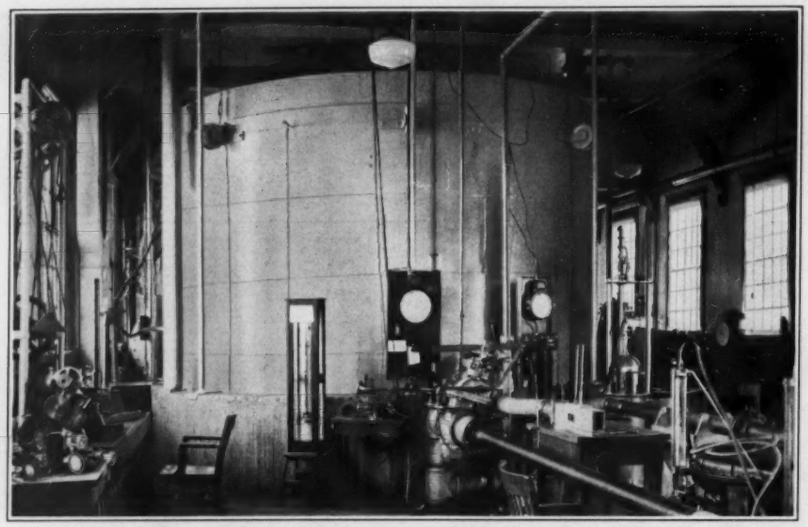
Complete Edition — Size: 8¼" x 16"— 88 Pages — Buckram Binding. Abbreviated Edition—Size: 8¼" x 16"—20 Pages—Flexible Cloth Binding.

Handbook of Casinghead Gas

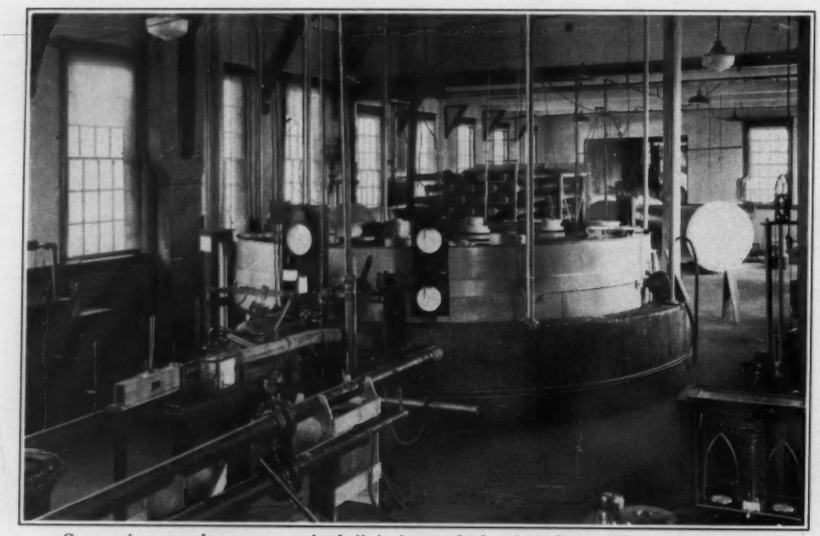
By H. P. WESTCOTT—Third Edition—Size: 5" x 7¾"—642 Pages—Cloth or Leather Binding.

Measurement of Gas and Liquids by Orifice Meter

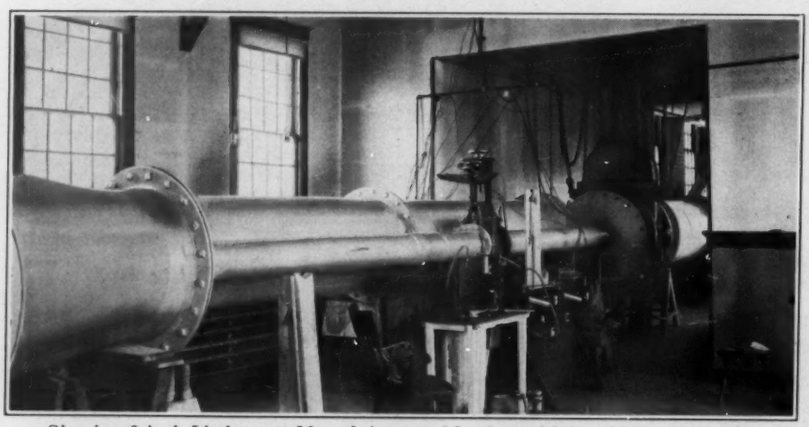
By H. P. WESTCOTT — Assisted by J. C. DIEHL—Second Edition—Size: 5" x 7¾"—434 Pages: 153 Tables: 136 Illustrations—Bound in Cloth or Leather. Also "Measurement of Gases Where Density Changes".



View of Laboratory looking East, showing holder raised, outlet conduit from blower installed above ceiling, water column for balancing pressure, mercury barometers, chronograph, connections at outlet of holder, wet and dry bulb thermometer case, and differential pressure gages.



Same view as above except the bell is lowered showing the weights on top of the bell and the inlet end of the multiple orifice prover.



Showing 8-inch Linderman Meter being tested by the multiple orifice prover and a section of 30-inch pipe which replaces the eight-inch line when testing the 30-inch meter shown in the background.

(Continued from page 1)

(1)—*Air and Power Supply*—

High Pressure lines are capable of delivering 60,000 cu.ft. of air an hour at a pressure of 90 pounds.

A suction fan is issued with a capacity of 1,500,000 feet an hour at10 inches of water vacuum in combination with a multiple orifice prover of like capacity.

Power lines supply 220 volt single phase and three phase A.C. 110 volt single phase A.C., 110 volt and 220 volt D.C.

(2)—*Standards of Measurement*—

For volume, temperature, pressure, specific gravity and time, fundamental standards calibrated by the U. S. Bureau of Standards are used to eliminate as far as possible any constant errors. Equipment includes standardized cathetometers, scales, engineer's tapes, cubic foot bottle, thermometers with microscopic sights, mercury barometers, etc. Scales for length are graduated to be read by vernier to 0.001 inch. All thermometers can be read to 0.01 degree.

Gage pressure is always determined by use of water or mercury U-Gages in which the area of one column of the gage is made 800 times the area of the other column or by means of calibrated draft gages.

Other interesting features of the description are treated in order under these headings:—(3) Precision Desired—(4) Barometric Pressure—(5) Holder Volume Calibration—(6) Holder Pressure—(7) Volume Reading—(8) Holder Temperature Effects — (9) Temperature Vapor Pressure Control—(10) Holder Thermometer Calibrations—(11) Change of Air Volume in Holder—(12) Specific Gravity of Air in Holder—(13) Flowing Temperature — (14) Differential Pressure Gages—(15) The Measurement of Time—(16) Test Procedure—(17) The multiple orifice Prover for Large Volume Orifice Meters.

The Erie Laboratory Bulletin may be obtained by writing to the Metric Metal Works Factory of American Meter Company.

Diaphragm Specialization

As Exemplified by Activities in One Factory

THE careful adaptation of Gas Meter Diaphragms to general working conditions and to individual Gas Company requirements is a matter of specialization in every American Meter Company factory.

To Gas Engineers who have visited D. McDonald & Company at Albany, the diaphragm activities in this factory have been of special interest. It is today the largest single producer of diaphragms in the world, with an annual output of more than one and one-half million diaphragms. This number, added to the production of other American Meter Company factories, makes an impressive figure. Here also the several factories of American Meter Company have concentrated the important phases of research relating to diaphragms and diaphragm oils.

The centering of this work in one place enables close observation and accurate records of the performance of diaphragms under the varying conditions which the Gas Industry offers. It makes possible a full realization of the long and practical experience possessed by the individual factories of American Meter Company.

Diaphragm Specialization along the lines indicated is based on sound and progressive manufacturing policy. It makes accessible to Gas Companies the fullest measure of co-operation in ascertaining the actual facts relating to diaphragms in service.

The accompanying photographs illustrate certain phases of diaphragm manufacture in the D. McDonald & Company factory. The top picture shows the diaphragms being cut from special vegetable tanned sheep skin and pasted. The center photograph pictures diaphragms being sewed. In this and other departments rigid inspection takes place. The bottom picture illustrates the winding of diaphragms on the rings.

Keeping Descriptive Literature Up-to-date

SINCE the publication of Catalogue G-1 for 1929 several clarifications and additions have already been made for inclusion in future publication.

The more important of these will be noted from time to time in *Gas Measurement Engineering*. All changes thus recorded will refer to corresponding pages of the 1929 Catalogue now in use. In this way, the General Catalogue may be kept completely serviceable until the appearance of the next issue.

As the need arises, certain sections of the Catalogue will be reprinted in revised bulletin form for the benefit of customers who are not interested in the entire line of products manufactured by American Meter Company but desire information on specific items such as Gauges, Thermometers or other departmental requirements. Any new bulletins will be announced and outlined in this publication on pages reserved for this purpose.

The basic installation of an 8-inch Linderman Orifice Meter showing also the integrator

Additions or Changes Affecting General Catalogue G-1, 1929

Large Volume Measurement by Linderman Orifice Meter

Pages 92 to 97 General Catalogue

WITH particular reference to the 6, 8, or 12 inch Linderman Meter—information relating to its adaptability to the engineering requirements of each particular installation was not brought out in the General Catalogue description.

This feature of flexible utility is made possible by the fact that anyone or all of four additional devices may be added to the basic installation to adapt this meter precisely to the conditions which the installation is required to meet.

The basic installation is the automatically changing orifice with a recorder and integrator for reading the registration.

The following devices may then be added to adapt the installation to operating requirements:

The Specific Gravity Device
The Pressure Device
The Temperature Device
The Temperature and Pressure Devices Combined.

These four additional devices are the same for the three smaller sizes of Linderman Meter and are individually priced. A customer may, therefore, build up an apparatus which will be adaptable to his individual requirements.

In the 16, 22 and 30 inch Meters the integrator and controller are adapted to these larger sizes and the meters are furnished completely equipped with devices.

NOTE: The combined temperature and pressure device can only be used where the percentage variation of the absolute pressures is comparatively small, as in the case of very low pressure distribution in the neighborhood that is of 20 inch water column.

SIZES AND CAPACITIES IN STANDARD CUBIC FEET PER HOUR

Pipe Size	*Low Pressure	*High Pressure
6	0 to 45,000	0 to 150,000
8	0 to 90,000	0 to 300,000
12	0 to 200,000	0 to 700,000
16	0 to 350,000	0 to 1,300,000
22	0 to 800,000	0 to 3,000,000
30	0 to 1,250,000	0 to 4,500,000

*Anything above 15 lbs. per square inch is considered high pressure.
The capacities given for low pressure meters are at 2 lbs. per square inch.
The capacities of high pressure meters given are for pressures of 50 lbs. per square inch.

The Linderman Meter will be exhibited at the Annual Convention of the Natural Gas Department of the A.G.A. meeting in Kansas City from May 6 to May 10.

WESTERN GAS

307 Thomas Building, Dallas, Texas
Phone 2-8708

447 Sutter Street
San Francisco, Calif.
Phone GArfield 2772

Publication Office, 124 West Fourth Street
Los Angeles, Calif. Telephone TUcker 8982

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Volume V **May, 1929** **No. 5**

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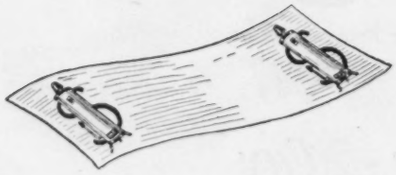
THE SIZE OF PAPER MONEY IS BEING REDUCED . . .

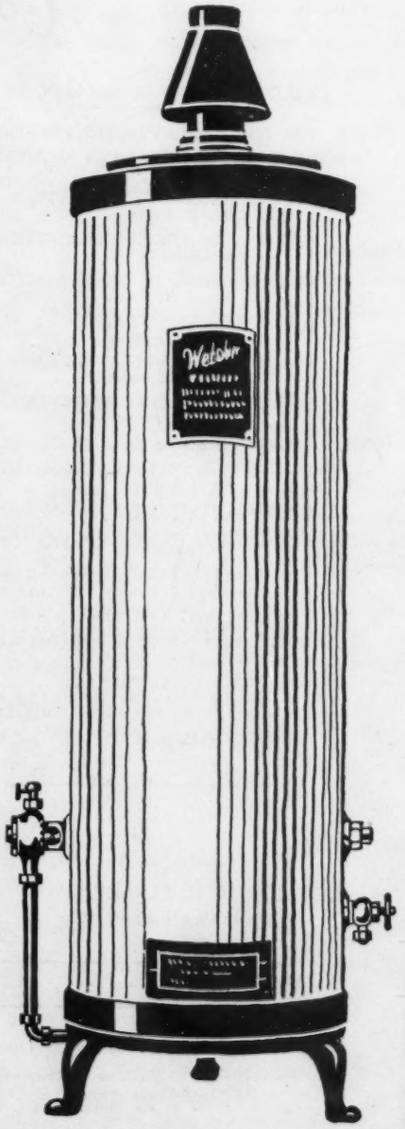


BUT THE WELSBACH HOTZONE INCREASES ITS BUYING POWER BY MAKING EVERY DOLLAR GO FURTHER THAN EVER BEFORE

THE answer is VALUE—in capital letters. For Welsbach has the experience, the production facilities, the desire to give the biggest dollar's worth of water heater service that can be supplied. Long experience with every phase of the gas industry has made it possible to back up this extra value with co-operation and service that smooths out business paths.

Welsbach Hotzone meets the need for a remarkable heater at a remarkable price. It fits today's selling conditions. Every installation assures smooth, even performance for years to come.

Made in four sizes: Fifteen, Twenty, Thirty and Forty-five gallons. For full details, write *Welsbach Company, Gloucester City, N. J.* Offices in principal cities.



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HOTZONE

WESTERN GAS

"Reg. U. S. Pat. Off."

A Monthly Journal of the Gas, Gas Appliance and Natural Gasoline Industries in *Western America*

SAN FRANCISCO **LOS ANGELES** **DALLAS**

Welcome, Natural Gas Men, to Kansas City

By T. J. STRICKLER

Chairman Arrangements and Entertainment, Annual Convention, Natural Gas Department, American Gas Association—Vice-President and General Manager, Kansas City Gas Company.

KANSAS CITY is preparing to be host to the Natural Gas Department of the American Gas Association May 6th to 10th. It feels complimented in having the pleasure and we wish to extend to all those attending a cordial welcome to the Heart of America.

To the visiting delegates Kansas City says:

"Every effort is being made to make your visit to our City an enjoyable one. It is the desire of all committees to make this an outstanding convention, one that will be remembered for years. A wealth of information awaits you in Convention Hall among the many displays, and in the Missouri Theater where the meetings will be held. From the time you arrive at the Union Station until your departure, there will be many things offered to you to see, to learn, and to do."

A more logical city to hold a Natural Gas Convention could not have been chosen, for Kansas City is a natural gas city to the fullest extent. The two cities combined enjoy the distinction of receiving the largest daily supply of natural gas in the world. It is the popular fuel for domestic, commercial, househeating and industrial use.

Natural gas has contributed much to Kansas City. From the public welfare standpoint it has been of increasing importance in making possible a cleaner city in which to live, to work and to play. It has raised the standards of production in the industrial plants by the developing of cheap power. In all, it has contributed greatly to the progress and prosperity of the city. Kansas City is known for its beautiful residential districts and gas heat is doing much to help maintain this reputation. More than four thousand homes are now being heated with gas and we anticipate adding eight thousand additional installations before the next heating season.

S. W. Meals
Chairman

Henry C. Morris
Vice-Chairman

E. J. Stephany
Secretary

T. J. Strickler
Chr. Arrangements

The industrial growth of the city is increasing rapidly and opening new fields for industrial gas. At the present time the majority of the leading industries in the city are using gas as their principal fuel. More than 3,156,407,000 cubic feet of natural gas was consumed last year.

The problems that confront us in Kansas City are naturally very similar to those in all other natural gas territories. However, if there should be any problems that we might be able to help the visitor solve, this will be our pleasure. During the convention our offices at 910 Grand Avenue and our organization will be at the disposal of the visiting delegates. If any of our departments can assist in any *(Continued on Page 87)*

The Convention *in* Session

Kansas City—the Union Station in the foreground

Program Events in Their Order of Occurrence

MONDAY . . . . MAY 6

9:00 A.M.

Exhibition of Appliances and Apparatus in Convention Hall. Hours 9:00 a. m. to 6:00 p. m.

10:30 A.M.

Main Technical and Research Committee and subcommittees meet in Room 4, Hotel Muehlebach.

12:00 Noon

Luncheon served in rear of Exhibition, Arcade of Convention Hall.

2:30 P.M. **Hotel Muehlebach Tea Room**

WOMEN'S MEETING

—for all women in all departments of natural gas companies.

Miss Lois Upshaw, Dallas, Texas, presiding.

Program:

New Business—by Keith Clevenger, The Empire Companies, Bartlesville, Okla.

The Home Service Job of Today—by Miss Grace Jo Mason, Public Service Company of Colorado, Denver, Colo.

Trade Paper Influence—George H. Finley, Managing Editor, *Western Gas,* Los Angeles, Calif.

Natural Gas Conventions in Retrospect—Miss Mary Spear, American Gas Association, New York, N. Y.

The New Cooperation—Industry Joins Industry—Miss Mary I. Barber, The Kellogg Company, Battle Creek, Michigan.

4:30 P.M.

Managing and Advisory Committees, Natural Gas Department, meet in Room 1, Hotel Muehlebach.

6:30 P.M.

Annual Dinner, Managing and Advisory Committees, Natural Gas Department, in Assembly Room, Hotel Muehlebach.

TUESDAY . . . MAY 7

9:00 A.M.

Exhibition of Appliances and Apparatus in Convention Hall. Hours 9:00 a. m. to 6:00 p. m.

10:00 A.M. **Missouri Theatre**

GENERAL SESSION

Opening Remarks by the Chairman—S. W. Meals, Chairman, Natural Gas Department.

Invocation—Dr. Robert Nelson Spencer, Rector of Grace and Holy Trinity Episcopal Church, Kansas City, Mo.

Address of Welcome—Hon. A. I. Beach, Mayor of Kansas City.

Address of the Chairman—S. W. Meals, Carnegie Natural Gas Company, Pittsburgh, Pa.

Appointment Committee on Chairman's Address—H. C. Morris, Vice-Chairman, Natural Gas Department.

Secretary's Report—E. J. Stephany, Pittsburgh, Pa.

In Memoriam—John M. Garard, Ohio Fuel Gas Company, Columbus, Ohio.

The Association's Obligations—O. H. Fogg, President, American Gas Association.

The Future of Our Industry—W. A. Jones, Chairman, Executive Committee, Henry L. Doherty & Company, New York, N. Y.

Serving the Industry—Alexander Forward, Managing Director, American Gas Association.

Some Pipe Line and Transmission Problems—John C. Diehl, Metric Metal Works, Erie, Pa.

12:00 Noon

Luncheon served in rear of Exhibition—Arcade of Convention Hall.

12:30 P.M.

Ladies' luncheon at Hotel Muehlebach, followed by sightseeing trip and tea at Mission Hills Country Club.

2:00 P.M. **Missouri Theatre**

GENERAL SESSION

What Natural Gas Adds to the Wealth of a State—H. J. Hoover, Natural Gas Consultant, Cincinnati, O.

Selling Domestic Gas—George Bowersox, Southern California Gas Company, Los Angeles, Calif.

Changing Over a City's Gas Supply—H. C. Abell, Vice-President, Electric Bond and Share Company, New York, N. Y.

What We Are Doing in Research—H. C. Cooper, Hope Natural Gas Company, Pittsburgh, Pa.

Measuring Large Volumes of Gas—T. R. Weymouth, Oklahoma Natural Gas Corporation, Tulsa, Okla.

Flow Through Pipe Lines—H. D. Hancock, Henry L. Doherty & Company, New York, N. Y.

Industrial Sales—R. M. Redding, Dallas Gas Company, Dallas, Texas.

8:00 P.M.

Smoker and Entertainment—Kansas City Athletic Club Gymnasium.

8:00 P.M.

Ladies' Theatre Party — Meeting place, lobby of Hotel Muehlebach.

WEDNESDAY . . MAY 8

9:00 A. M.

Exhibition of Appliances and Apparatus in Convention Hall. Hours 9:00 a. m. to 6:00 p. m.

9:45 A. M.

Ladies' trip to Loose-Wiles Biscuit Company's plant, followed by luncheon.

10:00 A.M. **Missouri Theatre**

GENERAL SESSION

Cracking Natural Gas—J. A. Yunker, Louisville Gas & Electric Company, Louisville, Ky.

Facts Relating to Natural Gas Service—J. J. O'Brien, President, Byllesby Companies, Chicago, Illinois.

Distribution—E. A. Clark, Oklahoma Natural Gas Corporation, Tulsa, Oklahoma.

Motion Pictures—Putting Out Well Fires—M. M. Kinley, The M. M. Kinley Torpedo Company, Tulsa.

12:00 Noon

Official Convention Photograph—Entrance to Convention Hall, followed by luncheon—Arcade of Convention Hall.

2:00 P.M. **Missouri Theatre**

GENERAL SESSION

The Gas Industry—A Giant Servant—R. W. Gallagher, President, East Ohio Gas Company, Cleveland.

Question Discussion, presided over by F. L. Chase of the Lone Star Gas Company, Dallas, Texas. The following questions will be open for general discussion:

1. In what form can news be best supplied local newspapers?
2. What are the latest developments in the use of expansion joints on welded lines?
3. What are the best methods of covering or coating pipes to prevent corrosion?
4. What control methods are used for distribution system pressure regulation?
5. What distribution system changes are needed when changing from manufactured to natural gas?
6. What metering equipment is best for large industrial customers?
7. How can the volume of gas wells best be determined with the least waste of gas or danger to wells?

6:30 P.M. **Colonial Ballroom, Hotel Muehlebach**

ANNUAL BANQUET NATURAL GAS DEPARTMENT

Toastmaster, Freeman T. Eagleson,
Columbia Gas & Electric Corp., Columbus, Ohio

Speakers

Getting the Most Out of Life—By Edward James Cattell, Philadelphia, Pa.

How Big Is Your Business Picture?—By Joseph F. Leopold, Manager, South Central Division, United States Chamber of Commerce, Dallas, Texas.

THURSDAY . . MAY 9

9:00 A. M.

Exhibition of Appliances and Apparatus in Convention Hall. Hours 9:00 a. m. to 6:00 p. m.

10:00 A.M. **Missouri Theatre**

GENERAL SESSION

Report of Committee on Chairman's Address.

Some More Wrinkles—H. J. Struth, The Oil Weekly, Houston, Texas.

Natural Gas Research—N. A. C. Smith, Bureau of Mines, Bartlesville, Oklahoma.

What the Public Expects of the Gas Industry—H. C. Blackwell, President, Union Gas & Electric Company, Cincinnati, Ohio.

Symposium—Selling to the Home—Mrs. Luella M. Fisher, Chairman, Home Service Committee, A. G. A., Erie, Pa.

Report of Committee on Final Resolutions.

1:30 P.M.

Inspection trip to industrial plants of Kansas City.

Highlights *in* Today's

Markets Widen as Pipe

By CRAIG ESPY

Route map showing course to be taken by Pacific Gas and Electric Company carrier

IT IS the purpose of this article to briefly review some of the major natural gas transmission projects begun or completed during the past year, giving at the same time essential details on some of the existing systems, and outlining a few of the projects planned within the industry for the future.

While a passing survey of this sort necessarily must omit mention of some developments, and present only the highlights of others, it does suffice to clearly mark out the direction in which the industry is moving. Everyone knows that Western America is the scene of revolutionary present expansion in natural gas service. By gathering together information on many individual developments, affecting in their scope the majority of the States west of the Mississippi and even linking States farther eastward to bountiful gas supplies of this Western section, it is desired to indicate how considerable is this challenging outreach of natural gas which we are now witnessing.

Most recent of the many gas line enterprises to crystallize into definite form are two outstanding transmission projects now in the spotlight of public interest, from the standpoint of immediate construction—the line from the Monroe and Richland fields in Louisiana to Atlanta and the industrial gas line from the same fields to St. Louis. Contracts are being let on the Atlanta project, and the St. Louis line is actually under construction, both enterprises being introduced by months of intensive engineering research work to determine load values and to anticipate problems which will be encountered.

The Monroe and Richland Parish line to Atlanta, projected by the Southern Natural Gas Corporation, will aggregate approximately 1278 miles of trunk line and branch mains, the actual main line being about 428 miles in length. The huge sum of $43,000,000 is estimated as required to bring this undertaking to completion, and is thought that it may be necessary in years to come to loop the entire line.

Gas will be secured from companies who control 95 per cent of the producing acreage in the Monroe field and 80 per cent of the acreage in the Richland field, as well as considerable acreage in the East Carroll field north of Richland.

The bankers for the Southern Natural Gas Corporation are G. L. Ohrstrom & Company, Incorporated of New York, who are also bankers for the Oklahoma Natural Gas Corporation of Tulsa, Oklahoma, the American Natural Gas Corporation and others.

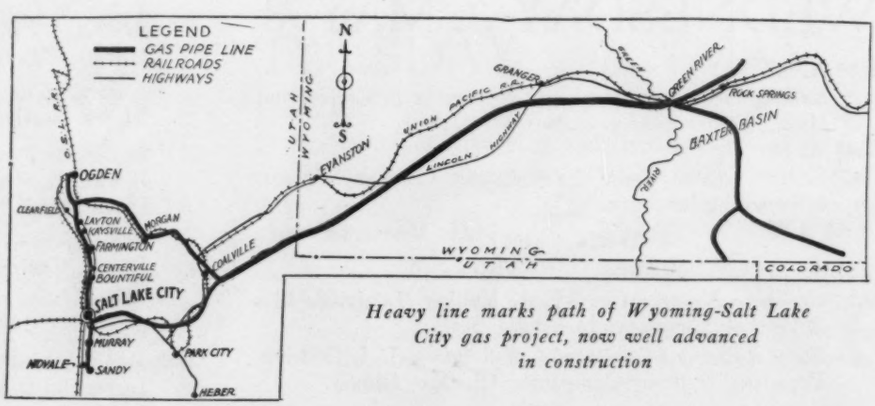
Among the towns to secure gas from the line are Vicksburg, Yazoo City, Jackson, Meridian, Kosciusco, Macon, Starkville, West Point, and Columbus in Mississippi; Tuscaloosa, Selma, Birmingham, Montgomery, Pell City, Anniston, Gadsen in Alabama; Chattanooga in Tennessee; Rome, Cartersville, Marietta, Atlanta, Jonesboro, Thomaston, and Macon in Georgia.

The Natural Gas Engineering Corporation, subsidiary of the Southern Natural Gas Corporation, will have charge of the construction of the line. P. McDonald Biddison is chief engineer of the engineering corporation. Officers of the Southern Natural are R. C. Sharp, president and general manager, Adam H. Davidson of Dallas, vice-president, P. McDonald Biddison, vice-president and chief engineer.

Arthur L. Mullergren and Company of Kansas City, Mo., was the engineering firm who conducted the survey for the line and secured contracts from industrial consumers for a sufficient amount of gas to insure it. Mr. Mullergren was consulting engineer with reference to all city gate contracts.

In Atlanta, as well as in a number of other cities on the line, gas will be distributed at retail by the Central Public Service Corporation of Chicago who recently acquired the gas properties of the Georgia Power Company. Their contract with the Southern Natural includes the distribution of gas in Rome, Macon, Griffin and Atlanta in Georgia; Anniston, Gadsen, Selma, Montgomery and Tuscaloosa in Alabama; and Columbus and Meridian in Mississippi.

The idea for the construction of this major gas project originated in November, 1927, in the organization of the



Heavy line marks path of Wyoming-Salt Lake City gas project, now well advanced in construction

Natural Gas Revolution

Line Projects Multiply

Mid-Continent Manager
WESTERN GAS

Adam H. Davidson Company of Dallas, who has been specializing in natural gas financing for the past nine years. In April 1928 G. L. Ohrstrom & Company became associated with the financing of the line. In May of that year the Southern Natural Gas Corporation was incorporated in Delaware and in July, R. C. Sharp resigned from his presidency of the Oklahoma Natural Gas Corporation to become president of the company.

Contracts call for the delivery of the gas by December 31st of this year. The headquarters for the company are in the Watts Building, Birmingham.

Equally interesting to the industry is the Mississippi River Fuel Corporation's industrial gas line from Monroe, Louisiana to St. Louis, actual construction on which began the latter part of April, when seven gangs of men, four working on the unit between Monroe and Newport, Arkansas, and three on the line between Newport and St. Louis, began operations.

Ford, Bacon & Davis have the engineering contract for the line, which will be approximately 460 miles in length. They have appointed as subcontractors, Williams Brothers, Inc., of Tulsa and the Oklahoma Contracting Company of Dallas. The unit between Monroe and the north bank of White River at Newport, Arkansas, will be constructed by the former firm, and Oklahoma Contracting will lay the line north of this point to St. Louis. Williams Brothers have established headquarters at Pine Bluff, Arkansas and Oklahoma Contracting Company in Popular Bluff, Missouri, which are central points on the two units. Ford, Bacon & Davis has located headquarters at Little Rock.

The three gangs working north of Newport were started respectively at Newport, Popular Bluff and St. Louis. The territory south of the White River is equally divided between the four gangs employed by Williams Brothers.

The line will be 22 inches in diameter with Dresser Couplings being used throughout. It will run almost due north, deviating to the east or west only when it is necessary to provide a better location for a river crossing or to keep out of lowlands.

Some of the towns in Arkansas which the line will touch or which will be in close proximity to its course are Crossett, Hamburg, Monticello, Pine Bluff, Lonoke, Kensett, Judsonia, Bald Knob, Newport, and Hoxie. Missouri towns along or near the line are Popular Bluff, Walnut River, Greenville, Farmington, Fredericktown and St. Louis.

Five compressor stations, including the one at the point of origin, will be constructed. Three of these will be located in Arkansas, one south of Glandale, another south of Kensett and the third north of Dalton and West of Corning. A station will also be constructed near Twelve Point, south of Zion, in Missouri.

The above sketch indicates route of Louisiana-St. Louis industrial gas line, construction on which began in April

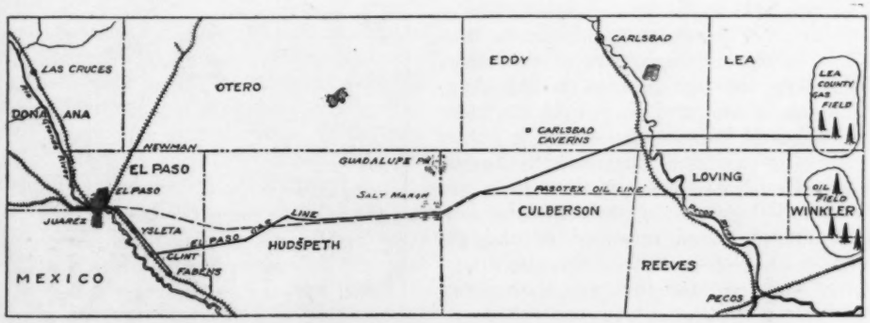
River crossings will cause the major amount of engineering difficulties, there being a considerable number—among them the Ouachita, Arkansas, St. Francis, White River, Little Black River and the Mississippi. The latter will be crossed in taking the line to East St. Louis, Illinois, which will be one of the major markets served with natural gas. It is expected that the line will also be extended to serve Alton, Illinois. If present plans carry, gas will be turned into the line around November 1.

Interests behind the project are the Standard Oil Company of New Jersey, The United Gas Company of Houston, Texas, The Electric Bond & Share Company and the United Carbon Company. It is estimated that the cost of the line and pumping stations, without including well and field costs, will amount to approximately $30,000,000.

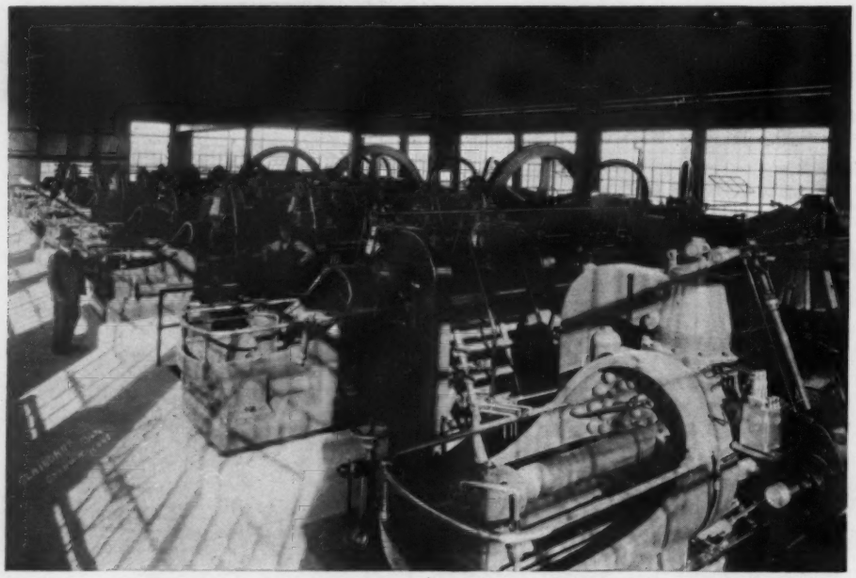
In St. Louis no gas franchise was asked for, but rights-of-way were obtained where it was necessary to cross streets to reach the industrial districts.

Next in interest, perhaps, are several lines now in advanced stages of construction. Of this latter group is the line being constructed from the Lea County, New Mexico, fields to El Paso; the Baxter Basin, Wyoming-to-Salt Lake City, Utah, carrier; and the San Joaquin Valley-to-San Francisco Bay area line.

An article on another page of this issue of *Western Gas* relates some of



Natural gas from New Mexico fields will soon be flowing to El Paso, Texas, along the above path



Ottawa, Kansas, compressor station on the Cities Service Gas Company's line from Texas fields to Kansas City. Four 1,000 B.H.P. Cooper units are shown

the engineering problems in connection with the construction of the El Paso line. The advent of natural gas into this border city, denotes the passing of one of the last strongholds of manufactured gas in the State of Texas.

From Southwestern Wyoming into Salt Lake City, Utah, another transmission development is nearing completion bringing natural gas to several Utah cities and supplanting locally mined coal and manufactured gas in many homes and industries.

Actual construction on this Baxter Basin, Wyoming, to Salt Lake City, Utah gas line was begun in January, and is expected to be completed in August. The main line lying between the Green River in Wyoming and Salt Lake City is 149 miles in length composed mostly of 18-inch pipe. Extending beyond the Green River to the gas fields is 18 miles of 8-inch pipe, 63 miles of 16-inch pipe and 17 miles of 14-inch pipe.

At a point on the main line near Coalville a 42-mile 14-inch extension is laid in a northwesterly direction to within a few miles of Ogden where it connects with a line going north from Salt Lake, which serves Ogden and several communities between Salt Lake and Ogden.

The Western Public Service Corporation, holding company for the interests backing the project, was organized under the laws of Delaware on October 6, 1928. Parties represented are the Crawford interests of Pittsburgh, The Ohio Oil Company and the Prairie Oil & Gas Company.

This corporation owns the stocks of the Mountain Fuel Supply Company, the Uintah Pipe Line Company, the Ogden Gas Company, the Wasatch Gas Company and over 99 per cent of the common stock of the Utah Gas & Coke Company.

Mountain Fuel Supply Company owns the gas producing lands in Wyoming and Utah and will own and operate the gathering lines from the fields to the junction point at Green River. The Uintah Pipe Line Company will transport the gas from the junction point to the city gate at Salt Lake City, and will also own the 14-inch branch line extending toward Ogden. The Salt Lake City-Ogden line, serving Ogden and the communities between these points, is owned by the Wasatch Gas Company.

The Utah Gas & Coke Company, supplying manufactured gas to Salt Lake City, and the Ogden Gas Company were acquired by the natural gas interests in December, 1928, from the Insull interests.

"NATURAL" TO NORTHERN CALIFORNIA

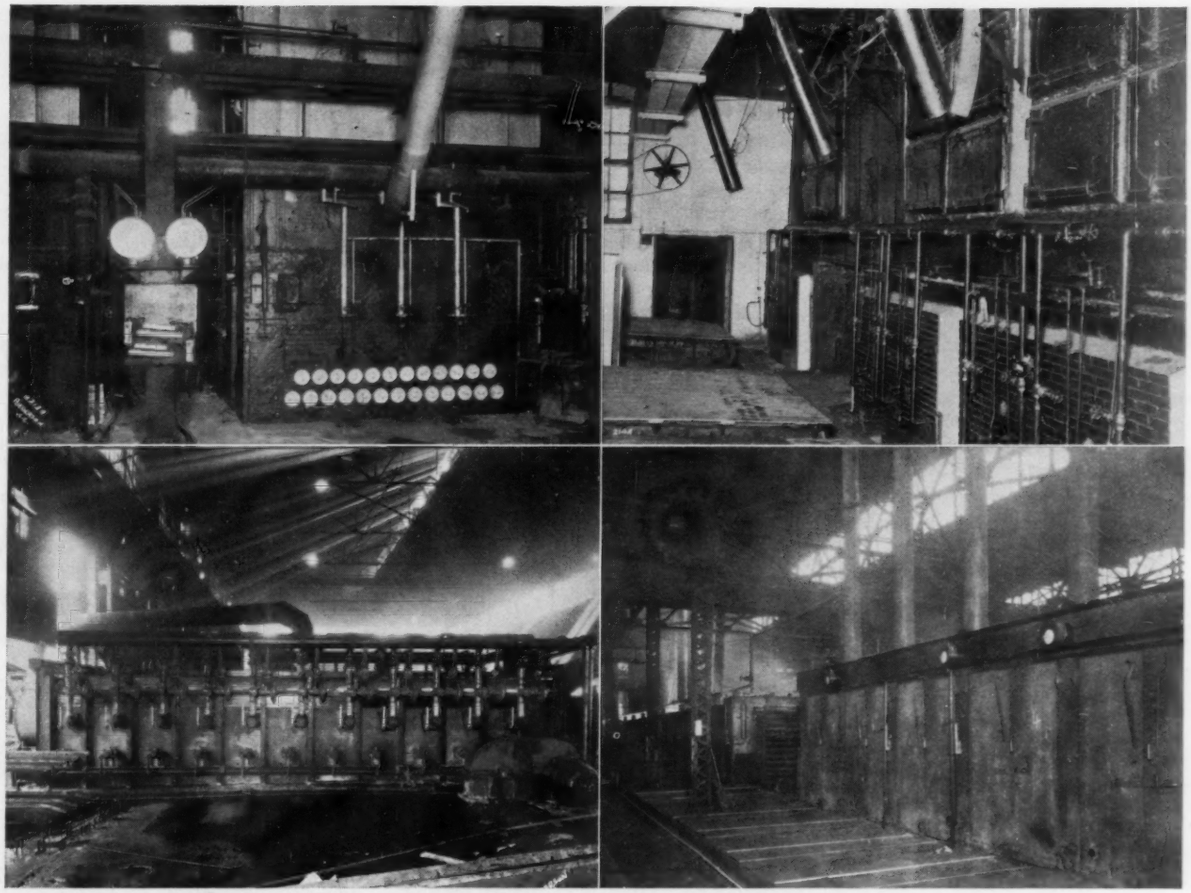
Elsewhere in this issue Willis S. Yard, vice-president of the Pacific Gas and Electric Company, offers a comprehensive progress report on the gas carrier being laid from San Joaquin Valley fields in California to population centers in the northern part of the State. Due for completion this coming August, the P. G. and E. project has more than usual importance because it affects a highly developed gas market. In the San Francisco Bay area alone there are some 370,000 gas customers, who will be served mixed reformed natural gas upon completion of the line. Industrial application of gas fuel will show measurable gains.

The Pacific Gas and Electric Company enterprise is also expected to make straight natural gas available over much of the Coast Counties Gas & Electric Company system, immediately affecting Tres Pinos, Hollister, San Juan, Gilroy, Morgan Hill and possibly other sections of the company's Southern Division, with a number of changes of service involved in its Contra Costa county territory.

SOME OF THE 1928 HIGHLIGHTS

A glance back over the past year brings into bold relief the completion of the Amarillo-to-Denver line, the construction of the Monroe-to-Memphis line, the construction of the Consolidated Gas Utilities line from Wheeler County, Texas, to Enid, Oklahoma; also the Arkansas Natural's line from Clarksville to Little Rock and the extension of the Magnolia Gas Company's system into the Cotton Valley field in North Louisiana, together with the extension of the Cities Service Amarillo line into Kansas City, the laying of the Montana-Dakota Power Company's line from the Baker-Glendive fields in Montana to Black Hills communities in South Dakota, and other new gas line projects or extensions, many of which are briefly touched upon below.

(*Continued on Page 82*)



A few of the industries on the lines of the Kansas City Gas Company. UPPER LEFT: One of the gas boiler installation at the Standard Oil of Indiana, Inc., plant. RIGHT: Wilson Packing Company. LOWER LEFT: Battery of gas furnaces of Sheffield Steel Company. RIGHT: American Radiator Company gas furnace installation

Gas *in the* Convention City

By RAY T. RATLIFF
Kansas City Gas Company

MANUFACTURED gas was first furnished in Kansas City in 1868 to a few hundred customers. Since that time, the popularity of gas as a fuel has steadily increased until it is now recognized as the popular fuel for all uses.

The first important change in the gas industry so far as Kansas City was concerned was in 1905, when natural gas was first brought to the city. At that time gas was secured from fields near the city and it was thought that gas supply worries were at an end.

For a few years all was well, but suddenly difficulties arose and Kansas City was very much aware of the fact that the gas supply was not what it used to be. Natural gas development was new and not stabilized, and no scientific or studied efforts had been made to develop new fields of natural gas for the growing needs of the city or to replace the gas fields as they became exhausted. Frequently during the winter of 1916 Kansas City was without gas.

About eight years ago Henry L. Doherty & Company, operators of the Cities Service Gas Company, acquired the physical property out of the possession of the receivers and since that time have operated the supplying gas company. That particular transaction meant much to Kansas City. The pipeline company tapped new fields; new lines were built, looking not only to the needs of the present, but anticipating the ever-increasing requirements of the future.

That this vision did not outrun the actual possibilities for gas service in the Kansas City market is demonstrated in the past winter's showing. This year the city experienced the coldest January and February in 10 years and for 46 consecutive days the thermometer hovered around zero. This was a serious test for the pipeline company as well as the distribution system of the Kansas City Gas Company. On December 24, 1928, the thermometer read 43° and the company supplied 36,390,000 cubic feet of gas. A few days later, due to the extremely cold weather, the demand for gas was practically doubled and the company was called upon to deliver 63,200,000 cubic feet.

The availability of such an abundant supply of gas has made possible, to a

(Continued on Page 94)

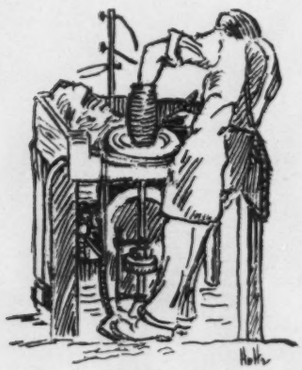
Gas Fuel *in the* Manufacture *of* Chinaware

Illustrations by the Author

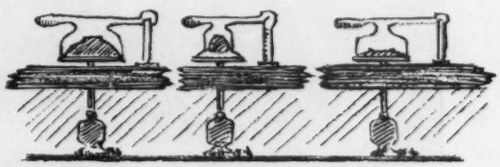
By LEE HOLTZ

General Superintendent, Manufacture and Distribution, Southern California Gas Company

The Egyptian potter shaped his wares by hand



Semi-modern potter's wheel



Modern motor-driven wheels

IT IS safe to say that no one has done more to familiarize gas men with the ceramic industry and the peculiar suitability of gas fuel for that industry's needs than has the author of the present article—eighth in a series of individual ceramic subjects discussed in the columns of *Western Gas* by Mr. Holtz. Other articles in this valuable series have discussed the application of gas in firing building brick, face brick, roofing tile, sewer pipe, telephone conduit, fireproofing materials, ornamental terra cotta, decorative tile, and pottery. Together these articles give the industrial engineer a real insight into this important industry, which has an attractive load for the gas utility.—*Editor.*

OF all the sections of the ceramic industry, the white ware division is perhaps one of the most intricate from the manufacturer's standpoint, and is without question one of the most interesting. Chinaware or porcelain, as it is sometimes called, derives the name "China" from the fact that this class of ceramic ware originated in China in the early part of the 16th Century. At the present time we hear of French Chinaware, English Chinaware, American Chinaware and chinaware of many other countries that have adopted that name.

To differentiate between the words "china" and "porcelain" is perhaps best done by the following explanation, or at least it seems that among the ceramic profession this explanation is more cordially accepted. The contention is that on the basis of characteristic body and glaze, it would be highly desirable from a ceramic viewpoint to classify "porcelain" as all vitreous ware, which is translucent in thin sections and unglazed or coated with a hard or difficult fusible glaze maturing at the maturing temperature; and for "china," all vitreous ware which is translucent in thin sections and coated with a soft or moderately fusible glaze maturing at a distinctly lower temperature than the body. But perhaps for the average layman, and on the basis of general usage, it can be claimed that the terms "porcelain" and "china" are synonymous.

In this article it is the endeavor to explain the manufacture of ordinary decorated and plain china tableware, such as plates, cups, saucers, water pitchers, service sets, etc., and to follow the process, we will start in the clay mixing room and proceed through the factory step by step in the course of manufacture, emphasizing the part that gas fuel plays in producing this very essential commodity.

The clay materials used the ball clay, china clay, silica and feldspar. These materials are mixed with water, passed through a fine meshed ground screen, over a magnet for removal of metallic parts, and then passed to a pressure filter which removes most of the water. After removal from the filter, the material is then piled in a storage room, which is kept cool and at a fairly even temperature. This clay, which is very plastic, is piled upon platforms, covered with wet sacks and allowed to stand for at least two weeks to age or cure. After maturing, the clay is then passed through pug-mills which provide a uniform mixture and correct plasticity. The time consumed for the preparation of clay from the water mixing stage to the workmen is about 15 days.

The material is now ready for the workmen who do the shaping of the plates, cups, saucers, sugar bowls, etc. Most of this work is done on what is known as a jigging machine. The principle involved in this machine is that of the old-time potter's wheel; the article or piece under construction revolves on a horizontal plane and while in motion is shaped as desired. In the olden days this was done by hand. However, today the jigging machine supplants the old potter's wheel. The revolving table is now a plaster mould.

The moulds are made by specially trained men, known as china dish designers. Quite often one designer is employed by several manufacturers at the same time due to the fact that such highly skilled men are few in number and that the factories do not change patterns often enough to keep them fully occupied.

After the design has been accepted by the manufacturer, a working drawing is then made. From this drawing a blank mould, roughly shaped in a very fine high grade plaster of Paris, is then produced. The blank mould is next placed on a turning lathe or potter's wheel, depending upon the nature of the work, and the contour and general design is shaped by hand, using fine cutting tools. To complete a pattern often requires many days of tedious labor. The mould, however, is only shaped to conform to the inside contour of the

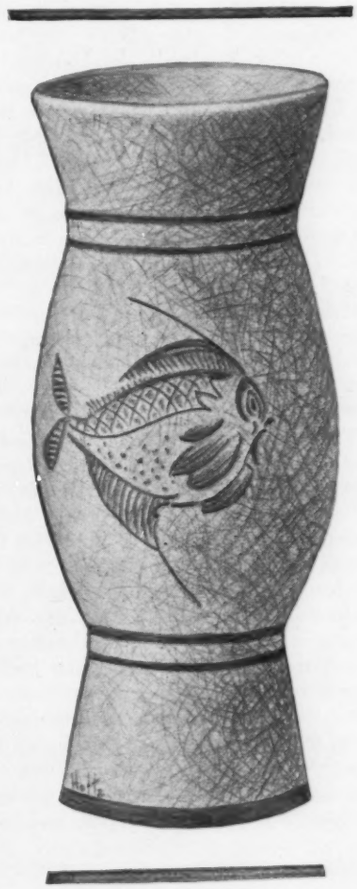
dish or plate, and the bottom or outside contour is shaped by a metallic template which is brought in contact with the revolving clay by the workmen. This template shears off the surplus clay, leaving the exact desired shape of the outside or bottom of the article. The revolving plaster of Paris mould absorbs and extracts enough of the moisture in the article to allow it to be removed by hand and placed on drying pallets. In the case of the manufacture of cups, the handles are put on by hand and the complete cup is then placed in humidifying driers. After a three-day drying period, the ware is then ready for the first or bisque firing.

The green ware is placed in containers called saggers, which are piled in the kilns, one on top of the other. The kilns are usually of the down draft type. The dishes or pieces are piled in the saggers one upon the other. The saggers, or burned refractory clay boxes, are used for two purposes—one being to keep any impurities of the products of combustion away from the ware itself, and the other to simplify the placing of the ware in the kiln by stacking one sagger over the other.

In most ceramic firing the amount of the burn is either considered by the weight or piece, but in the firing of "china" ware, the count is usually kept by the dozen. One factory the writer has in mind has kilns that burn some 5000 dozen bisque pieces in one kiln at a firing and require approximately 50 hours for the burning process. The kiln is then shut down and allowed to cool for three days before the ware is drawn. The whole process of firing the kiln, from the time loading begins until it is absolutely empty, requires nine days for bisque ware. Bisque ware is quite hard, rather rough and light cream in color.

After the bisque ware is brushed and cleaned it is dipped in a glazing material. The glaze is a finely ground mixture of water, frit, silica, feldspar, lead carbonate, clay, zinc oxide and carbonate of calcium. This material is prepared by grinding in pebble mills and requires about 24 hours for the grinding of a batch. It may be of interest to bring out here that the pebbles mentioned are of very hard stone and in some cases are imported. They are stones in their natural shape as they come from the streams. However, they are hand picked and are as near round as can be had. If metallic balls were used, it would be necessary to pass the fritting material through magnetic separators to remove iron or steel particles. The mill is either stone lined or is made of a very hard porcelain material. It requires about two days time to prepare glazing material ready for use.

After the glazing material has been placed on the bisque ware, another firing, which is known as the glost burn, becomes necessary. The product is placed in saggers a little differently than in the case of the bisque loading. Triangular refractory pins are placed in openings in the sagger walls and the dishes are piled upon these pins in order that they may be separated. As has been explained in preceding articles, the glazing material in its molten state would be quite disastrous to the product were the pieces to touch one another; and due to the fact that the pieces must be separated, only some 3000 dozen can be burned in one glost firing, in comparison with 5000 dozen of bisque. It requires about 30 hours time to complete the burn, or about seven days from the time the kiln is loaded until empty.



Modern porcelain vase

The temperature required for firing bisque ware is about 2500 degrees Fahrenheit or to Cone 8. It requires approximately 325,000 cubic feet of 1100 B.t.u. gas to prepare 5000 dozen ordinary tableware pieces in the bisque; and for the glost firing, Cone 4 is brought down, which means a temperature of 2210 degrees Fahrenheit, and requires some 225,000 cubic feet of 1100 B.t.u. gas.

After the glost firing has been completed, the pin points, which are made by the sharp edges of the pins, are dressed off and the ware is then selected for decorating. Of course, only the best pieces are accepted. This means that any chipped, cracked or warped articles are discarded. About two days time is required for cleaning and inspecting of one kiln of ware. The pieces are now ready for decorating.

In decorating, the designs of flowers or conventional figures are put on by transfer and the lines or edge striping are put on with a brush by hand by girls particularly trained in this field. If striping is desired, the plates or saucers are put on a small revolving table, which is made to move by hand or knee and the striping done with a very fine camel hair brush while the article is in motion. This work is done with remarkable rapidity and accuracy. The time required to complete a piece can almost be counted in seconds. Upon completion of this operation the ware is then ready for the third and last firing.

Decorating kilns are usually of the muffle type and rectangular in shape. Approximately nine hours time is needed to complete a burn and a temperature of 1300 degrees Fahrenheit, or the bringing down of Cone .018 is necessary before the ware is satisfactorily finished.

In one plant which the writer has in mind the firing procedure cares for approximately 300 dozen pieces at one burning and requires about 45,000 cubic feet of 1100 B.t.u. gas. Decorated ware can be placed in the kiln one day, fired the next and drawn the third day. The time necessary for the complete decorating and firing operation is usually about five days, whereupon all pieces are inspected, sorted and then packed in straw in barrels or crates and sent to the market.

The writer has interviewed many china dish manufacturers and they all contend that gas fuel is far superior to that of any other fuel they have used. The many reasons for this contention are as follows: cleanliness, ease of control in firing, less cost, less time required, flashing or discoloration rarely, if ever, being experienced, as so often occurs with the use of the heavier hydrocarbon fuels; and among many other favorable features is the immense saving in kiln repairs.

If it were not for the fact that the use of saggers is necessary for the stacking of the ware in the kilns, the saggers could without question be eliminated by

(*Continued on Page 92*)

LOAD BUILDING *IN* DENVER

accompanying the change-over to "natural"

By ROBERT H. TAYLOR
Engineer of Gas Utilization
Public Service Company of Colorado

AN INDIVIDUAL named William Shakespeare, now deceased, once wrote a story in which he had one character remark to another that it was not the start or the end of a journey, but the part in between which was the most tedious. Despite the well-established fact that Shakespeare was in no way connected with a natural gas company, many members of the fraternity hail him as an individual prophet because of this remark.

Men connected with the project of bringing natural gas to Denver say that the steps between the idea of employing Amarillo gas in a city nearly 400 miles distant and the monthly billings of the Denver customers after its use had commenced measured up to the Shakespearean definition.

The idea of bringing natural gas to the Capital City of Colorado is several years old, but it existed in a comatose state until early in 1927. At this time, the Standard Oil Company of New Jersey, the Prairie Oil Company, the Cities Service Company and other interests joined in an endeavor to determine whether or not such an idea was feasible. The source of supply was assured, the question being that of obtaining a market that would give a profitable return on the money required.

DETERMINING THE MARKET

The first step probably consisted of determining from a map what potential markets existed between Amarillo and Denver. For example, Pueblo, Colorado, with a Cities Service subsidiary, the Pueblo Gas and Fuel Company, was a very likely prospect.

Step number two involved a study of each locality where it seemed possible to use natural gas. Here the work became more involved. In Denver, for instance, there were several classes of use for which natural gas might be well suited. The largest field available for quick development was residence heating, a field which had hardly been scratched because of the excessive cost of manufactured gas as compared to coal. Many industrial firms were potential customers and the field for industrial and commercial use was surveyed. Increased domestic consumption, resulting from summer water heating and use of auxiliary space heaters, entered the picture.

The methods followed by the Industrial Fuel Department of the Denver Division of the Public Service Company of Colorado are probably truly representative of the work required in this second step. This department, under the leadership of Chas. W. Gale, first made a listing of all Denver industries. Firms which did not use heat were eliminated. Recourse was then had to the survey cards of the department, a result of several years activity, wherein were recorded a goodly portion of the prospects. From these cards was obtained the kind of fuel in use at present, the quantity, quality and price, and from these data was calculated the volume of natural gas required, with proper allowances for relative efficiencies, increased business and similar factors. Where no survey card was available, the industrial or commercial prospect was visited and the information obtained.

After all of the prospects were worked out and the gas consumption for each estimated, a tentative rate was drawn up by the Rate Department, and the gas fuel cost for each prospect calculated. A few plants were immediately taken out of the picture because of the excess of gas cost over the present fuel, but this number was small. The remainder were then arranged in price scale, the one showing the greatest decrease in fuel cost by the use of natural gas leading, the one showing the greatest increase bringing up the rear. Later on, when the rate was finally being decided upon, it was easy to determine from such a listing just how many of the tail-enders would be eliminated as prospects by a rate increase. Another listing by size made it simple to decide what percentage of the prospective load would be affected by a rate change. Since several different types of rates were considered before the present one was adopted, the method followed proved to be worth the effort involved.

Step three was to determine how much it would cost to serve these prospects. The Operating Department was called upon to furnish this information. It was decided that the larger industrials would be served by an industrial

Form 75—Misc. 5M—12-28

REQUEST FOR HOUSE HEATING ESTIMATE

Date..... Master No.....

Residence Address..... No. Rooms.....

Name..... Res. Tel. No.....

Business Address..... Tel. No.....

Owner ☐ Renter ☐..... Fuel Used.....

Heat. Warm Air ☐ Hot Water ☐ Steam ☐ Vapor ☐ Stoves ☐

Remarks:.....

Requested by..... Terr. of.....

Fig. 1. Form for recording request for house heating estimate

ADDRESS

NAME

MASTER NO.

TEL. NO. RES. BUS.

RECORD OF ESTIMATE AND SALE

RECEIVED FROM	RECORD OF SURVEY CARD		RECORD OF ESTIMATE SHEET	RECORD OF LEASE
	ISSUED TO EST. ENGINEERS	RECEIVED FROM EST. ENGINEERS	ISSUED TO REPRESENTATIVE	SENT TO ORDER CLERK

RECORD OF JOB INSTALLED
RECEIVED
EXECUTED A ORDER

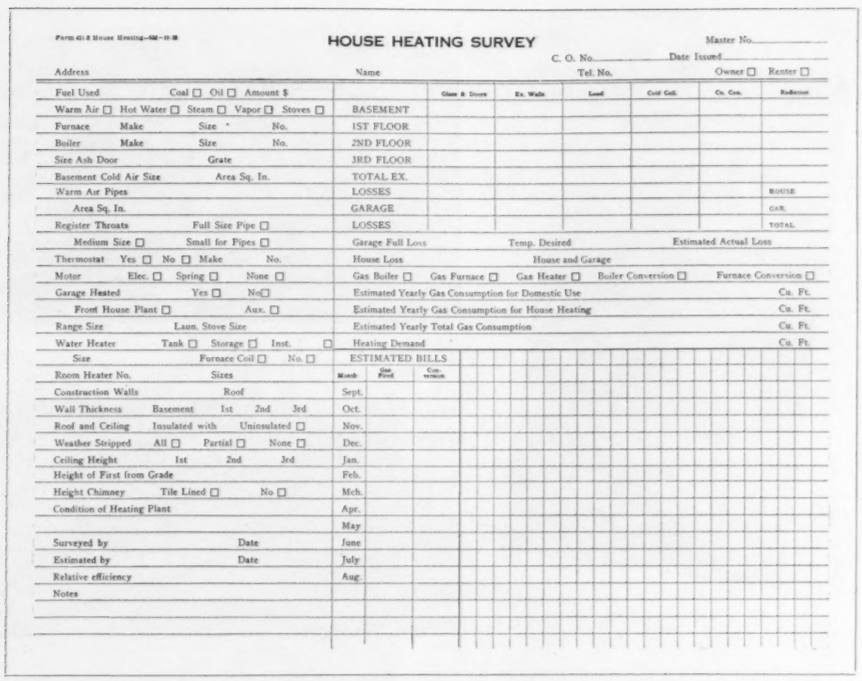
REMARKS:

SOLD BY

Fig. 2. Master house heating card used by Denver company

AT RIGHT:

Fig. 3. The survey card used by Estimating Division of Public Service Company of Colorado for detailed house heating data. Reverse side of card is cross-ruled for sketching to scale



HOUSE HEATING SURVEY

Master No.

C. O. No. Date Issued

Address Name Tel. No. Owner ☐ Renter ☐

Fuel Used Coal ☐ Oil ☐ Amount $		Glass & Doors	Ex. Walls	Load	Cold Coll.	Cu. Con.	Radiation
Warm Air ☐ Hot Water ☐ Steam ☐ Vapor ☐ Stoves ☐	BASEMENT						
Furnace Make Size No.	1ST FLOOR						
Boiler Make Size No.	2ND FLOOR						
Size Ash Door Grate	3RD FLOOR						
Basement Cold Air Size Area Sq. In.	TOTAL EX.						
Warm Air Pipes	LOSSES						HOUSE
Area Sq. In.	GARAGE						GAR.
Register Throats Full Size Pipe ☐	LOSSES						TOTAL
Medium Size ☐ Small for Pipes ☐	Garage Full Loss Temp. Desired Estimated Actual Loss						
Thermostat Yes ☐ No ☐ Make No.	House Loss House and Garage						
Motor Elec. ☐ Spring ☐ None ☐	Gas Boiler ☐ Gas Furnace ☐ Gas Heater ☐ Boiler Conversion ☐ Furnace Conversion ☐						
Garage Heated Yes ☐ No☐	Estimated Yearly Gas Consumption for Domestic Use Cu. Ft.						
Front House Plant ☐ Aux. ☐	Estimated Yearly Gas Consumption for House Heating Cu. Ft.						
Range Size Laun. Stove Size	Estimated Yearly Total Gas Consumption Cu. Ft.						
Water Heater Tank ☐ Storage ☐ Inst. ☐	Heating Demand Cu. Ft.						
Size Furnace Coil ☐ No. ☐	ESTIMATED BILLS						
Room Heater No. Sizes	Month / Gas Fired / Conversion						
Construction Walls Roof	Sept.						
Wall Thickness Basement 1st 2nd 3rd	Oct.						
Roof and Ceiling Insulated with Uninsulated ☐	Nov.						
Weather Stripped All ☐ Partial ☐ None ☐	Dec.						
Ceiling Height 1st 2nd 3rd	Jan.						
Height of First from Grade	Feb.						
Height Chimney Tile Lined ☐ No ☐	Mch.						
Condition of Heating Plant	Apr.						
	May						
Surveyed by Date	June						
Estimated by Date	July						
Relative efficiency	Aug.						
Notes							

line carrying a pressure of about 40 pounds per square inch, while the smaller ones in most cases could be handled from the existing low-pressure distribution system. A spot map was made, every spot representing the exact location of a customer. The industrial line was laid out and the construction cost estimated. Several such estimates were prepared, one with all prospects reached, others with the more inconvenient ones eliminated.

Industrial prospects on the present low-pressure mains were next considered and calculation made to determine what main reinforcement would be required. In some instances where such reinforcement would occur naturally within a few years with continued use of manufactured gas, only a portion of the expense was charged against the new gas.

The same general procedure was followed by the other departments—Domestic, House-Heating, etc.

Step four consisted of determining what rate should be adopted. The cost of gas at the town border was taken, and to this was added the various expenses incurred in getting the gas to the customers' appliances and the cost of giving necessary assistance in enabling him to use it satisfactorily. This was done for each rate contemplated. The number of customers obtainable under that rate, the gross revenue estimated and similar factors were given due consideration and eventually a rate was decided upon.

Form 14-HH—6M—11-28 Master No.

PUBLIC SERVICE COMPANY OF COLORADO

HOUSE HEATING ESTIMATE

Address Type of House

Name Phone

Business Address Phone

Terr. of

ITEM	SALES PRICE
Gas Boiler Gas Furnace	$
Fuel Run	
Installation	
Conversion Installed	
Thermostat	
Chimney Lining	
Miscellaneous	
TOTAL	

ESTIMATED GAS BILLS			NOTES ON HEATING SYSTEM
MONTH	GAS FIRED	CONVERSION	
Sept.	$	$	Heating Plant Type Condition
Oct.			Type Fuel On Hand Yearly
Nov.			Radiation
Dec.			Warm Air Pipes
Jan.			Cold Air Pipes
Feb.			Type Hot Water Htr.
Mar.			Length of Fuel Run
Apr.			Border Comb Burner Yes ☐ No ☐
May			Fire Boxes Grate
June			
July			
Aug.			
YEARLY TOTAL	$	$	

Estimated Yearly Gas Consumption { Domestic M Cu. Ft. $ / Heating M Cu. Ft. $

Heating Demand Cu. Ft.

Max. Hourly House Loss B.T.U.

The Company's estimate herewith is based upon average gas heating cost but is not a guarantee.

Fig. 4. House heating estimate sheet

As rapidly as was possible, the information from each locality was forwarded to a central point, where it was discussed and digested. Finally, it was decided to build the pipeline.

The actual details of construction of the 340-mile pipeline joining Denver with the largest gas field in the world have been well covered in the article by Geo. Wehrle, which appeared in the July, 1928, issue of *Western Gas*. Nor need any lengthy story of the change in Denver be given, as this work has been described in *Western Gas* for November, 1928.

During both the preliminary survey or inspection of gas customers and the actual change over to natural gas service, the closest co-operation existed between the Operating and Commercial Departments and a multitude of tips were turned in, not only on replacements, but on water heaters, plates, house heating, commercial and industrial prospects.

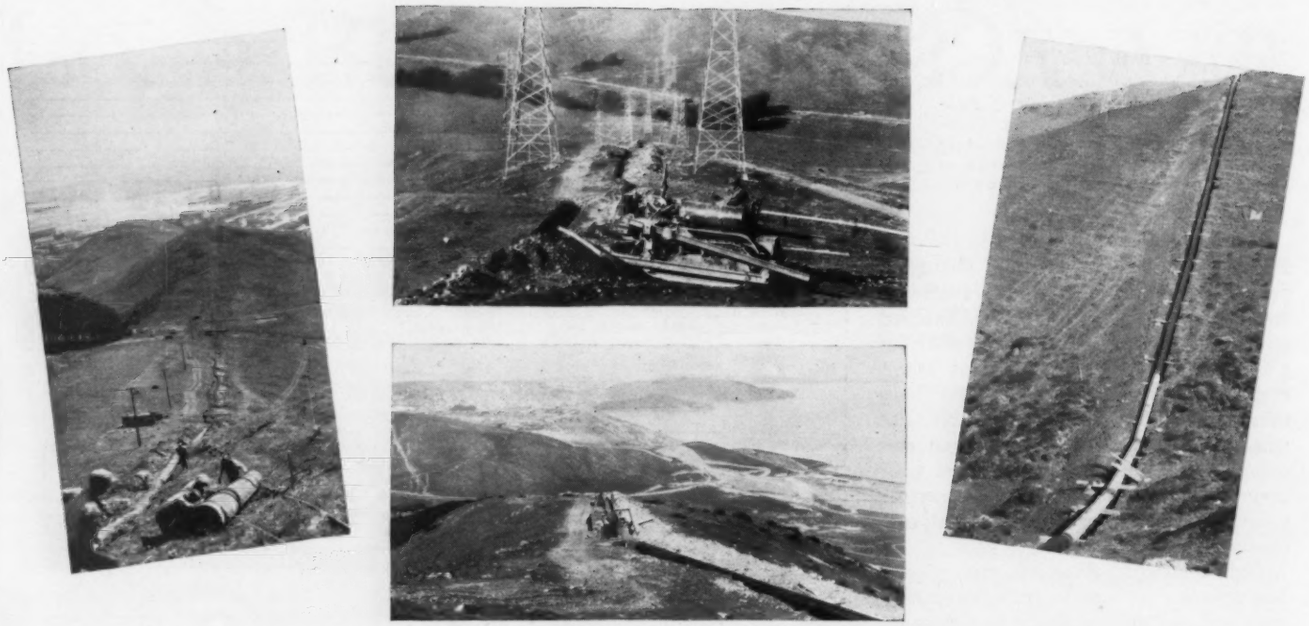
For the past several years, the Gas Commercial Department has followed the plan of specialized salesmen. The Domestic Gas Division, led by C. A. Bigler, sells ranges, water heaters, hot plates, incinerators, and similar appliances, excluding house-heating equipment. The House Heating Division, under the direction of F. M. Chelf, assisted by W. M. Gaylord, handles the residence heating. The Industrial Fuel Division, captained by Chas. W. Gale, has the responsibility of both commercial and industrial load building. While a strict separation exists between the departments as far as personnel is concerned, there is the utmost harmony between them. In some instances, embryo house-heating salesmen first obtain experience in the Domestic Division before starting house-heating work.

In 1927, when the initial plans were made for the sales program for 1928, it was decided to retain the specialists for house-heating sales work and to introduce the estimating system, using engineers to do the estimating. The general plan, which after more than a year's trial has proven eminently satisfactory, is somewhat as follows:

HOUSE HEATING SALES PLAN

A tip for a house-heating sale originates in the customary manner, is written up on the request for house-heating estimate (Fig. 1), and is forwarded to the House Heating Division. Here the house-heating clerk checks the files to see if a survey has ever been made out and if not, fills in the master card (Fig. 2). Master cards carry a master number and all subsequent transactions refer to this master number. The esti-

(*Continued on Page 92*)



Views on the line to San Francisco Bay area. LEFT: Pipe being hauled into position with cable and tractor. UPPER CENTER: Backfiller at work. LOWER CENTER: Section of 20-inch line being lowered—San Francisco in the background. RIGHT: Showing pipe welded on cross ties. Note wrapped pipe at bottom of gulch

A Progress Report *on the* P. G. *and* E. Natural Gas Project

By WILLIS S. YARD

Vice-Pres. in Charge Gas Construction and Operation, Pacific Gas and Electric Company

NORTHERN CALIFORNIA centers are shortly due to come within the scope of the natural gas main as a result of the Pacific Gas and Electric Company's $13,000,000 project to bring gas from San Joaquin Valley fields to the San Francisco Bay area and intermediate points served by the company. On January 31 formal announcement of this undertaking was made by President A. F. Hockenbeamer, and the machinery was set in motion to build and maintain this giant transmission and distribution system. Construction work is proceeding rapidly, with completion of the line expected before August 1.

In the present article it is the purpose to briefly describe features of the line's construction, and to touch upon plant changes and other phases in the program for serving mixed reformed gas in San Francisco, Oakland and San Jose.

The route and chief units of the line may briefly be described as follows:

A 16-inch main is to extend from the Buttonwillow gas field, near Taft in Kern County, to Kettleman Hills, the latest and perhaps largest gas area to be developed in California. At Kettleman the line raises to 22-inch and extends in that size to Mendota, Fresno County. Here it reduces to 20-inch diameter and turns west through Panoche Pass to Tres Pinos. Hollister, Gilroy and San Jose are on the line route to Milpitas, at which point a metering station is to be established. Two branches will leave this station, one to San Francisco and the other to East Bay points—Oakland, Alameda, Berkeley, and Richmond.

An 8-inch branch line will serve Fresno, this branch leaving the main carrier near Huron and running 40 miles along the floor of the San Joaquin Valley.

Total amount of pipe to be laid, including the branch from Milpitas to Oakland, will be 289 miles—the equivalent of more than 1800 cars or 30 trains of 60 cars each. Early in January the order was placed for 282 miles of steel pipe with the A. O. Smith Corporation of Milwaukee, a consignment of some 41,000 tons of pipe for the main line. Western Pipe & Steel Company is manufacturing pipe for the Milpitas to Oakland extension.

Coincident with the laying of the line, storage facilities of the Pacific Gas and Electric system are being increased by the additions of two holders in the Bay area—a 10,000,000-cubic foot capacity holder at San Francisco and an 8,000,000-cubic foot holder at Oakland. This brings the total storage capacity for the Bay territory to more than 60,000,000 cubic feet.

Gas will be turned into the pipe line at the Buttonwillow and Kettleman Hills fields at a 400-pound pressure, which will be reduced enroute to 50 pounds for delivery in San Francisco

and Oakland. Welded line construction is being followed throughout.

Near Kettleman Hills a compressor plant of 62,000,000 cubic feet daily capacity is to be erected, its equipment to consist of five 760 H.P. compressors. At a later date a booster station will be built near Paicines, between Kettleman Hills and San Jose. This station should raise the line's ultimate capacity to at least 125,000,000 cubic feet.

The laying of the line itself as it has progressed thus far has been distinguished by some very interesting experiences, although in the main, no unusual engineering problems have been encountered.

Contractors are laying the line from the gas field to Milpitas, while the two branches of the Y, i. e., one to San Francisco and one to Oakland, are being laid by the Pacific Gas and Electric Company. On the division between South San Francisco and San Francisco, very steep hills had to be contended with. In one instance the line has a fall of over 400 feet in a 900-foot length. Pipe was either snaked up the hillside by tractors or carried up the steeper portions by means of cables. All of this hillside excavating was necessarily done by hand. The remainder of the trench is being dug by two trenching machines.

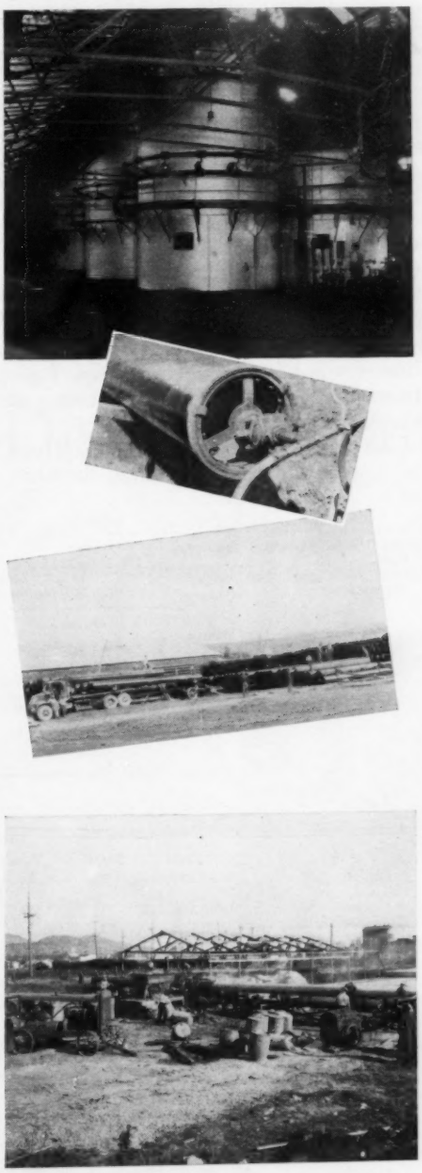
Pipe is all buried with a minimum of 18 inches cover. As far as possible the line, after it is laid in the trenches, is slightly staggered to provide for a certain amount of expansion. Some time ago the P. G. and E. buried recording thermometers at various places over the system and it was found that there is less than 10 degrees temperature change in any one place. This being the case, the expansion and contraction difficulties are not so great as they might seem on a line that is all welded.

All the joints are butt-welded and the gas company on the section it is laying itself is generating acetylene gas from portable generators mounted on trucks. At the outset the welders experienced some difficulty with their welds, but it was found that this was due to their unfamiliarity with the high carbon steel pipe. Once they learned how to work with this metal, no more trouble of this kind developed.

TESTING

On the portion of the line that runs up the peninsula from Milpitas to San Francisco and the branch running to Oakland, extraordinary care has been taken in testing. A soap sud test at 90 pounds pressure is made on every joint and before any section of pipe is backfilled a 24-hour recording chart test at 90 pounds pressure is being made. Approximately every 5,000 feet of pipe is later tested with a seven-day recording test. The test head shown in one of the accompanying photographs is of our own design and has worked very satisfactorily in this phase of the work.

The two contractors on their sections of the line are lowering the pipe with tackle and tripods, but on the part being built by the company itself, a crawler type of crane is being used with great success. In one unit, 2700 feet were lowered within an hour and four minutes.



UPPER: Oil gas generators which shortly will be reforming gas at the Potrero plant of the P. G. and E., San Francisco. INSERT: Test head designed by P. G. and E. for use on 20-inch line. CENTER: Pipe storage yard at Tres Pinos, from which point trucks deliver to the job. LOWER: Pipe wrapping machine at work

A large portion of the line is being wrapped with a protective cover and portable wrapping machines operating in the field are taking care of this phase of the work. All joints are coated and hand-wrapped before lowering. The trench is back-filled with regular commercial back-filler and tractors.

TRANSMISSION EQUIPMENT

Natural gas will be accumulated at Buttonwillow field from seven wells, all within the radius of about three miles. As this is a dry gas, it will go from wells directly into the mains under its own pressure. This pressure, however, will be reduced by pressure regulators from 1000 pounds to 400 pounds. Each well is also connected with drips and orifice meters. The estimated daily delivery capacity of Buttonwillow is from 30 to 50 million cubic feet per day if required.

A 16-inch line carries the gas from Buttonwillow 53 miles to Kettleman Hills. Here two wells are already down and more are drilling, and it is from this field that the large potential gas supply is expected. Plans have been completed for drilling 20 wells in this area, and by the time the pipe line is completed several should be producing gas and oil. The Kettleman Hills productive oil zone is over seven thousand feet deep, so that six months is the minimum time in which a well completion may be expected. Geologists agree that the Kettleman Hills and adjacent territory represent one of the largest potential gas and oil reserves in California. Other wells being drilled between Buttonwillow and Kettleman Hills, and for considerable distances east, show the presence of large quantities of gas. The extensive area over which gas has been found in this section makes certain a large supply for many years to come for the Bay area.

This gas is not dry, however, and consequently, the oil companies will extract natural gasoline from it prior to delivering it to the P. G. and E. lines. This gas will be delivered at 400 pounds pressure, but to provide for any difficulties that might be encountered in introducing this gas into the line or in keeping up the uninterrupted flow into the 22-inch line that starts at Kettleman Hills, the 62,000,000-cubic feet compressor station previously mentioned is to be constructed.

At Kettleman Hills will be located the main field headquarters for the line and here a permanent camp will be built with living quarters and facilities for a corps of about 40 men. At the site that has been secured near Paicines all the necessary fittings

(*Continued on Page 88*)

Louisiana Resources Are Basis *for* Steady Gas Expansion

By CHARLES A. BREITUNG

Consulting Gas Engineer
Shreveport, Louisiana

THE year 1928 witnessed the completion of several major gas pipeline projects in Louisiana which had been forecast and planned early in the spring of last year.

In June the Magnolia Gas Company commenced construction of its telescope line addition which linked up the Monroe-Richland gas fields to the company's extensive Texas systems. This line was built in sections, of 14-16-18-inch Smith-steel electric welded pipe. One-third of the line was electrically welded by artisans of the A. O. Smith Corporation and the balance was done by acetylene welding crews. The line stretches across northern Louisiana from the Monroe and Richland gas fields over to the Latex station of the Magnolia. Attention may be directed to the many new ideas introduced into the pipeline construction—bell and spigot joints—electric welded fabrication of pipe—expansion sleeve couplings—electric welding of the pipeline. The project marks another step forward in pipelining. Natural gas was passing through the 100 miles of line in September—approximately 100 days after the construction work started.

Another project of considerable importance was the introduction of natural gas into the city of New Orleans for domestic, commercial and industrial uses. The New Orleans Public Service Corporation, after careful study and planning, demonstrated a new, albeit entirely sound, idea in gas merchandising, of signing up the load in an intelligent manner to capture such an increase in consumption as to offset the decrease in domestic rate structure caused by the change from artificial to natural gas.

The situation aroused in New Orleans, whereby a public utility, after rendering service for many years, was forced to compete against fictitious and unsound promotions, was finally taken care of by the Public Service Company continuing in the harness. The various maneuverings in the situation constitute a comprehensive contribution to public utility management, and demonstrate the salient fact that a good airing is the utility's best method of protection.

During the summer the Southern Gas Company, a subsidiary of the Southern Carbon Company, laid a 6-inch lateral line a distance of 18 miles into the town of Winnfield to serve the town proper.

The balance of the old Crusader oil line was put in service to transport gas from the Monroe fields to the towns at the Mississippi River terminal.

Through process of merger the Hunter Estate interests, controlling considerable gas reserves in the Monroe and Richland area, were linked up with the Electric Bond & Share Company gas interests in the State.

In the fall the Memphis Natural Gas Company line from Monroe to Memphis, Tennessee, was commenced. This line consisted of 212 miles of 18-inch pipe, principally, and involved a Mississippi River crossing at Sunnyside Landing, Arkansas. The line will ultimately serve the cities and towns along the way in Arkansas, Mississippi, and Tennessee, its principal function, of course, being to supply the large Memphis area with natural gas.

TABLE NO. 2

Carbon black production Monroe Field	137,314,120 Lbs.
Carbon black production outside Monroe Field	439,075 Lbs.
	137,753,195 Lbs.
Est. Gas used for carbon Monroe Field	99,700,121,000 Cu. Ft.
Est. Gas used for carbon outside Monroe Field	550,570,000 Cu. Ft.
	100,250,691,000 Cu. Ft.

TABLE NO. 1—1928 GAS PRODUCTION IN LOUISIANA BY FIELDS
State of Louisiana, Department of Conservation, Minerals Division

Field	*Parish*	*Total for Field*		*Total for Parish*
Bellevue	Bossier	37,847,000		
Carterville	Bossier	10,488,648,911		Bossier —23,039,729,926
Elm Grove	Bossier	8,552,960,719	12,071,756,824	
Elm Grove	Caddo	3,518,796,105		
Springhill	Bossier	3,960,573,297		
Springhill	Webster	292,465,000	4,253,038,297	
Old Caddo	Caddo	4,673,866,187		
Waskom	Caddo	3,051,318,203		Caddo Total — 11,243,980,495
De Soto	De Soto	2,310,500,033		
Cameron (Sweet Lake)	Cameron	412,085,874		
Lockport	Calcasieu	332,524,260		
East Carroll	East Carroll	49,945,000		
Monroe Field	Morehouse	45,850,267,355		
	Ouachita	102,793,767,580	157,449,021,653	
	Union	8,804,986,718		
Red River	Red River	434,396,000		
Richland	Richland	9,216,625,000		
Sabine		26,992,000		
Winn	Sikes	2,275,000		
Cotton Valley	Webster	13,457,021,529		
Gleason	Webster	13,238,825,246		Webster Total — 26,988,311,775
Total for State		232,206,687,017 Cu. Ft.		

THE 1929 PROSPECT

The Arkansas Natural system of the Cities Service Gas Company has been contemplating the further extension of their gas lines, to link up more effectively with the vast gas reserves of the Monroe and Richland areas.

As a further enterprise for completion in 1929, the St. Louis line project, headed by N. C. McGowen of the Palmer Corporation, has now been put under way. The Birmingham-Atlanta line from Monroe is also looming on the horizon, as is the completely organized project of Belchic & Laskey to serve the numerous cities and towns in Southern and Central Louisiana. This service will be of paramount value to the State in the increasing industrial development afforded by natural gas.

The United Gas Company expects to tap its reserves in the Monroe-Richland areas by laying a line over from the pipeline system in northwestern Louisiana.

The Northwest Louisiana Gas Company in serving the Peoples Gas & Fuel Company completed a line tying in the Monroe end with the system in northwest Louisiana.

Meanwhile during

(Continued on Page 94)

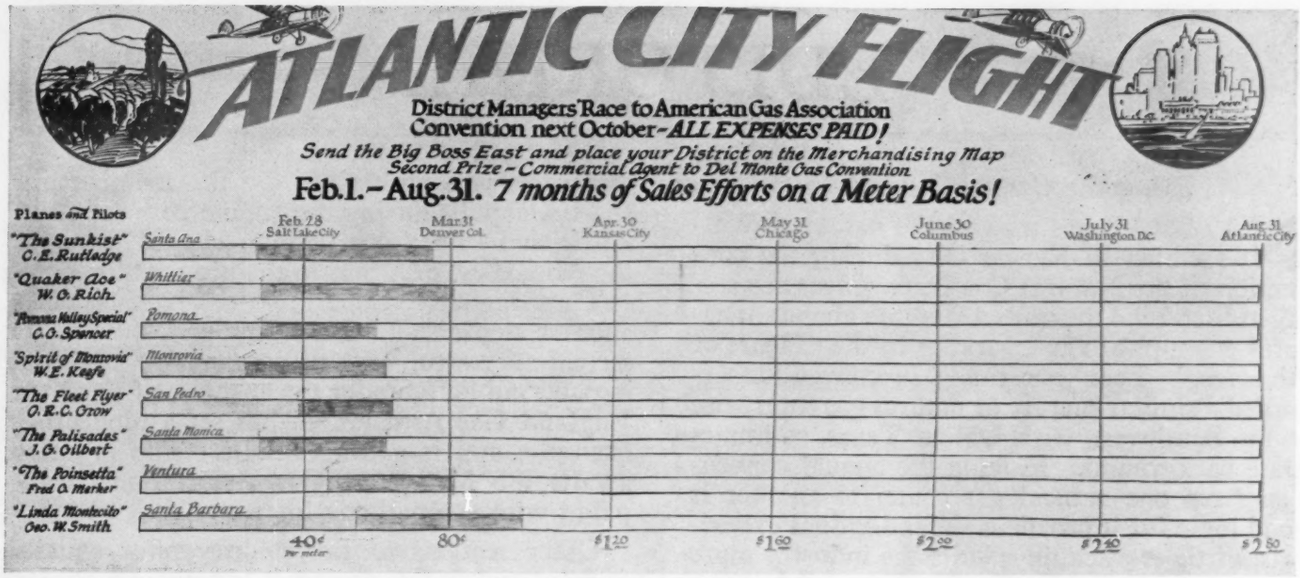

ATLANTIC CITY FLIGHT
District Managers' Race to American Gas Association Convention next October - ALL EXPENSES PAID!
Send the Big Boss East and place your District on the Merchandising Map
Second Prize - Commercial Agent to Del Monte Gas Convention
Feb. 1. - Aug. 31. 7 months of Sales Efforts on a Meter Basis!
Planes and Pilots
"The Sunkist" C. E. Rutledge
"Quaker Ace" W. O. Rich
"Pomona Valley Special" C. O. Spencer
"Spirit of Monrovia" W. E. Keefe
"The Fleet Flyer" O. R. C. Crow
"The Palisades" J. G. Gilbert
"The Poinsetta" Fred O. Marker
"Linda Montecito" Geo. W. Smith
Santa Ana
Whittier
Pomona
Monrovia
San Pedro
Santa Monica
Ventura
Santa Barbara
Feb. 28 Salt Lake City
Mar. 31 Denver Col.
Apr. 30 Kansas City
May 31 Chicago
June 30 Columbus
July 31 Washington D.C.
Aug. 31 Atlantic City
40¢ per meter
80¢
$1.20
$1.60
$2.00
$2.40
$2.80

Chart records the monthly progress of each district in the Southern Counties Gas Company "Sales Flight"

This Sales Contest Revolves Around *the* District Manager

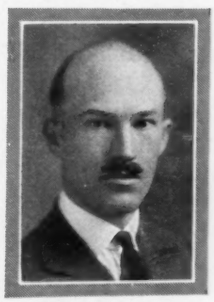
By CLYDE H. POTTER
Commercial Manager
Southern Counties Gas Company

SALES contests of one kind or another play a considerable part in most merchandising programs, and selling gas appliances is no exception. The contest idea has provided stimulus to many a sales force when the lure of commissions was insufficient to get maximum results. Therefore, any fresh approach to the contest theme is always welcomed by utility sales departments.

Something different in sales contests is under way on the southern California system of the Southern Counties Gas Company, and takes the form of an "Atlantic City Sales Flight," now well advanced and bidding fair to keep the curve of domestic appliance sales upward for the year 1929.

This "Atlantic City Sales Flight" is a contest extending over a period of seven months, from February 1st to September 1st, an activity in which each of the company's eight territorial divisions is pitted against the seven other districts.

The contest was laid out on a meter basis; that is, the sale of merchandise was based upon the number of active meters in each division. Thus, a district with only 10,000 meters will find it just as difficult to sell one dollar's worth of gas appliances per meter as will the larger district with 20,000 meters.



Clyde H. Potter

One of the vital and interesting features of this contest is the fact that the district managers of the eight territorial divisions are an important cog in the Atlantic City Flight machinery. The entire activity is built around the district manager and the campaign is known as the District Managers' Atlantic City Flight. In years past the company has inaugurated sales contests in which commercial agents and salesmen have won prizes, but never before a plan whereby the manager of the district participated.

In the present campaign the district manager in whose territory is sold the greatest volume of merchandise in dollars and cents on a meter basis, will be declared the winner. As reward for his victory he will be given a trip to the annual convention of the American Gas Association at Atlantic City during October of this year, with all expenses paid. The "runner-up" district, that division making the second greatest volume in merchandise sales, will send its commercial agent to the annual convention of the Pacific Coast Gas Association at Del Monte during the week of September 9 to 13, all expenses paid.

To add spice and interest to the race, an atmosphere of aviation has been written into the campaign. Each district manager has been given a mythical aeroplane and charted up to show his progress month after month. A reproduction of the chart evolved for this purpose is shown on this page.

In order to have a basis on which to chart the flight an arbitrary figure of 40 cents in appliance sales per meter per month was used. Seven months of sales would make a total of $2.80 in sales per meter. Each of the 40-cent division points on the chart, representing months, was given a geographical point on the aviators' map. For example, if Pilot Rutledge during the first month of the contest sold merchandise totaling 40 cents for each of the 27,559 active meters in his territory, he would therefore have flown the distance between Santa Ana, California, and Salt Lake City, Utah.

(Continued on Page 94)

EDITORIAL

Bring the Convention West!

NATURAL gas men of the nation now assembled in Kansas City during the convention of the Natural Gas Department are seeing at first-hand the miracles which abundant natural gas supplies are working in the "Heart of America." Last year the 1928 convention afforded a similar picture of natural gas enterprise in the Southwest, with Dallas, Texas, as immediate background. Moving the annual convention from one natural gas center to another is good logic for it broadens the individual experience of those attending, knits the industry more closely together, and carries the benefits of the convention itself in greater measure to gas men of the region selected.

And this introduces the question—Isn't it time for a "Far Western" natural gas convention? *Western Gas* holds no special brief for any particular convention point for 1930 but we do feel that the convention should come west. Los Angeles, San Francisco and Denver all come to mind as attractive sites for a natural gas gathering, but in selecting a western city the choice would probably fall upon Los Angeles, due to its long experience in natural gas service.

The complexion of the natural gas industry in California has changed considerably with the program now under way for bringing gas to northern California centers. When natural gas augments the supply of San Francisco, Oakland and other communities to benefit from this development, the scale of gas consumption for the entire Pacific Coast will swing heavily in favor of "natural." This consideration is an important one in setting up the claim of the western coast to the convention.

Gas men on the western coast would welcome a chance to play hosts to the 1930 convention and the selection of Los Angeles as convention city would be received with general favor.

Cooperative Advertising Gains

THE recurring subject of cooperative advertising is on the front page again with the Mid-West Gas Association's announcement of its endorsement given last month to a joint program of advertising designed to arouse gas consciousness in the public throughout the Association's territory—the states of Minnesota, Iowa, Nebraska, North and South Dakota. Appointment of committees to formulate a definite campaign was authorized by the membership at Minneapolis during the annual convention in April and something definite should come of the Mid-West program in the near future.

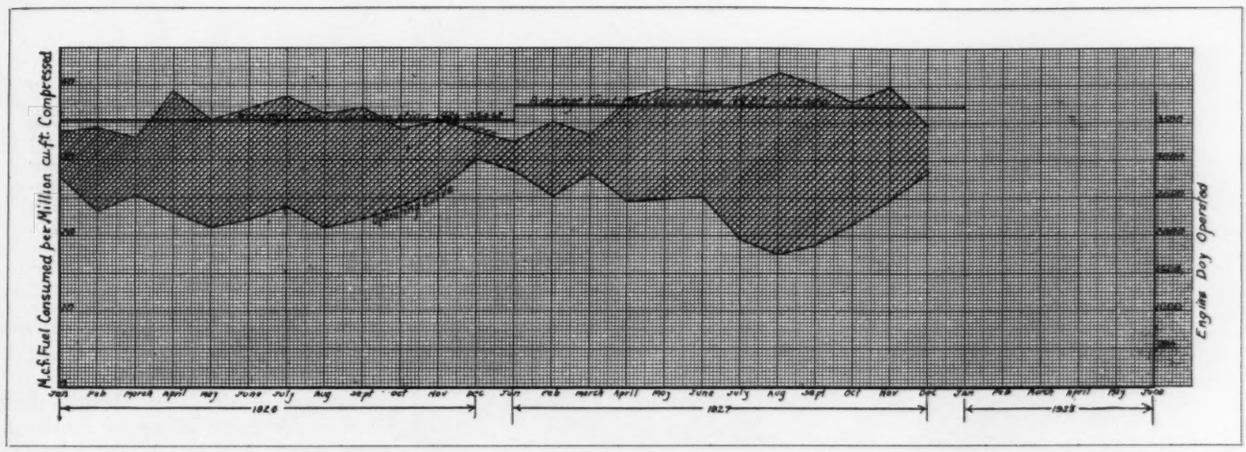
Thus regional cooperative advertising takes another step ahead. New England, now in its second successful year of cooperative advertising and publicity under the auspices of the New England Gas Association, has set a pioneering example, and is getting results. The industry awaits the Mid-West Gas Association's campaign with sympathetic interest.

Other sections of the country offer equally fruitful fields for regional advertising efforts. On the western coast committees of the Pacific Coast Gas Association have had this subject under consideration for several months and it is hoped that their work will crystallize into definite action very shortly. The cooperative advertising idea gains strength daily from successful precedent established for it, in the gas industry and out of it. The industry which does not advertise *as an industry* will soon be losing ground to rivals more alert in employing modern agencies for influencing public opinion.

Gas Appliances Are Not Second Best

AT A recent gathering of commercial men engaged in the merchandising of gas appliances the discussion turned upon comparison of the progress in appliance development made by the gas and electrical industries. One optimist saw better days ahead for the gas industry because our appliance manufacturers have begun to give us gas burning apparatus which is "just as good as" competing electrical equipment.

This attitude is typical of an unfortunate inferiority complex which has reached even into the gas industry itself, possibly as a reflex of the energetic sales tactics of electrical competitors. Why should we style gas appliances "as good as" when competitive tests have long proved them far superior for the bulk of domestic and general heating operations? In appearance value gas appliances of today actually excel. There is no reason for being soft-voiced about it. What the sales branch of the gas industry needs is to develop a positive psychology about its products. This attitude on the part of sales executives will quickly find its way through the ranks and on to the firing line of sales activity.



Comparison of fuel curve to operating curve of Lone Star Gas Company system

Compressor Station Personnel
the Vital Factor *in* Efficiency

Byron L. Rogers

By BYRON L. ROGERS
Superintendent Compressor Stations,
Lone Star Gas Company
Dallas, Texas

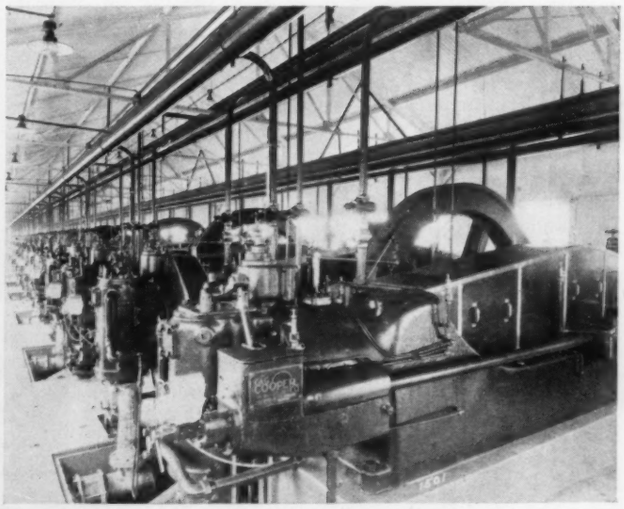
WHEN the number of compressor stations necessary to meet the demands of the Lone Star Gas Company's system had reached 13, it was considered advisable to vest supervision of those stations and others which were contemplated, in one man and create a Compressor Department.

As additional stations were built, when the total number exceeded 20, it became necessary to divide the system into districts geographically, and select five district engineers, who should make more frequent visits to all stations in their respective districts than could be made by the supervisor. These men were selected, and the entire organization so advised, for their organizing ability, their ability to develop men, their demonstrated loyalty to the company, their fairness to their men, their standing in the communities in which they live and their general fitness to represent the company as much as for mechanical ability in operating compressor stations.

The writer has often been assured that the secret of getting men to give their best and most conscientious effort is to keep them interested and not to discourage enthusiasm, to be as ready with judicious praise as with kindly constructive criticism. This is the philosophy applied in handling problems of personnel which arise on the Lone Star Gas Co.'s compressor station system.

The five district engineers meet once a month in Dallas with the supervisor, to exchange ideas and work out knotty problems. The supervisor tries to inspect each plant once a month in company with the engineer of that district. The district engineers thoroughly believe in the company and the high caliber of the men at its head and each believes he has the best engineers obtainable. It has always been a cardinal principle of the organization that no man can advance himself by tearing someone else down, and numerous times new men with Bolshevistic tendencies have been dropped from the service upon unanimous request of the three engineers at a plant, upon their offering conclusive proof that he was disloyal and a bad influence. Seniority is not a consideration when a new job is to be filled, but it goes to the man with the best record. This is thoroughly understood, also that length of service is not sufficient reason for an increase in salary but must be the reward for definite accomplishment.

That men all over the system are interested in their work and in improving themselves is evidenced by the number of men to take up the company's proposal



Breckenridge compressor station, Lone Star Gas Company, 16 engines of 170 H. P.

(*Continued on Page 90*)

Electric welding in progress on the El Paso Natural Gas Company's 200-mile, 16-inch line from Lea County, New Mexico, to El Paso, Texas. Frequent sandstorms make it necessary to protect welders by shields which completely house the operations.

Constructing *the* Natural Gas Line *to* El Paso

ONE of the principal natural gas projects being brought to completion in the West is that of the El Paso Natural Gas Company, which is now engaged in constructing a gas line from the Lea County field in New Mexico to El Paso, Texas. Unique problems involved in this undertaking have prompted WESTERN GAS to present the following review, made available for this purpose through the courtesy of H. G. Frost, vice-president and general manager of the El Paso Natural Gas Company.—EDITOR.

THE gas supply for the El Paso Natural Gas Company's line is derived from the Lea County gas field in the Southeast corner of New Mexico. The principal gas sand is about 50 feet thick and is found at a depth of approximately 3,000 feet, and the pressure at the wells is between 1,400 and 1,500 pounds per square inch. The gas is practically dry, testing less than 20 gallons of gasoline per million cubic feet, and most of the wells give gas entirely free from sulphur.

The open flow capacity of the wells is large—one well has a tested open flow of 90,000,000 cubic feet per day. The wells now under contract to the company have an open flow capacity of 350,000,000 cubic feet per day.

As indicated by present drilling, the extent of the field is 30 miles north and south, and four miles east and west. The gas supply shows an amount of gas sufficient to supply any market in El Paso that is likely to be developed for at least 35 years.

The El Paso Natural Gas Company will sell gas at the City Gate to the Texas Cities Gas Company, which will distribute the gas to the consumers inside the metropolitan district of El Paso, comprising a population of 118.000.

The El Paso Natural Gas Company will sell direct to the chief large consumers, such as the electric power company, the cement and brick plants and the smelters. It will also sell directly to the consumers along the Rio Grande valley from the town of Fabens to El Paso—a population of some 4,000.

Starting at the town of Jal, in the Southeast corner of New Mexico, the main line takes an almost straight course in a general westerly direction to the town of Clint in Texas, a distance of about 185 miles.

The first stretch of 50 miles from Jal to the Pecos River is extremely sandy, and hauling could be done only with tractors.

At Red Bluff, New Mexico, the line crosses the Pecos River on a substantial steel wagon bridge. Here, the line also crosses the Carlsbad—Pecos Highway and the Santa Fe Railroad.

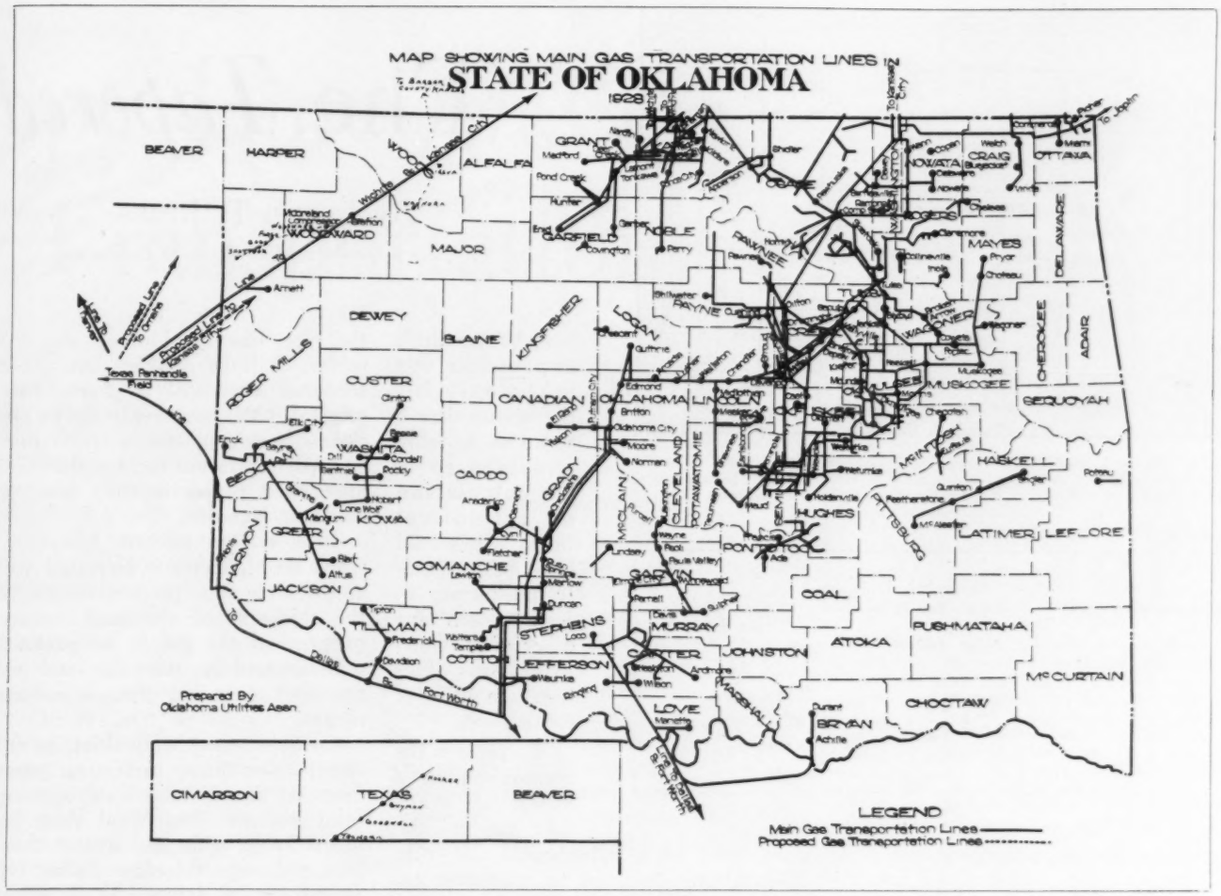
The 50-mile stretch from Red Bluff west, passes through "gyp country" and the Deleware Mountains, and is the roughest and most difficult part of the line. About 15 miles of solid rock occurs here, where the ditch can be made only by blasting.

Near the peak, El Capitan, the highest point in Texas, the line crosses the Carlsbad-Van Horn Highway. This highway and the railroad and highway at Red Bluff are the only roads crossed by the line from Jal to the valley of the Rio Grande, about 185 miles distant. Along this entire stretch only four or five ranch houses are visible from the right-of-way, and only one house is passed within a distance of a mile of the line.

The average distance of hauling, for stringing of pipe, is about 50 miles, and all supplies including water had to be transported long distances. Along parts of the line there was insufficient growth to furnish fuel for pipe bending. The extreme barrenness of the country, lack

(*Continued on Page 86*)

"At the Guadalupe Mountain crossing the line passes over a rimrock . . . . at a 40° slope."



54 Oklahoma Towns Grant Natural Gas Franchises *in* 1928

By O. D. HALL

Assistant Manager
Oklahoma Utilities Association

THE days when residents of western Oklahoma feared coal famines, or in times of financial depression burned hay and other substitutes for fuel, are being driven into the background by the rapidly spreading network of natural gas transmission and distribution lines through that section. Most other sections of Oklahoma have had natural gas service for several years. Four years ago there was practically no natural gas service west of a line running north and south through Enid and El Reno. With the bringing in of the Chickasha and Sayre gas fields a number of towns in the southwestern and west-central parts of the state were given gas distribution systems. Not until 1928, however, did great natural gas lines penetrate the heart of western and northwestern Oklahoma.

Fifty-four towns, most of them in western Oklahoma, granted natural gas franchises during 1928. Thirty-two of these secured gas distribution service. They were: Francis, Kingfisher, Muldrow, Texhoma, McLoud, Sasakwa, Arnett, Allen, Blanchard, Roxana, Marietta, Marshall, Konawa, Goodwell, Apache, Asher, Fairview, Grandfield, Fort Sill, Wanette, Weatherford, Hennessey, Okeene, Watonga, Hugo, Hitchcock, Southard, Custer City, Maysville, Canton, Lovell and Hooker.

The spring of 1929 is bringing about renewed activity on the part of companies that secured franchises last year, but experienced unforeseen difficulties or delays and did not get started on construction of lines. One of these is the Westchester Oil and Gas Company, which secured franchises in Woodward, Alva, Mooreland, Shattuck, Gage, Waynoka, Cherokee and other towns in northwestern Oklahoma and in southern Kansas. The company first agreed to have natural gas in these towns by October 1 of 1928, but the Knorpp interests, upon which the company was depending for a supply of gas, failed to build their proposed pipelines from the Texas gas fields to Kansas City. The Winchester company later secured a supply of gas in the Barber County, Kansas, field and announce that work will proceed rapidly. Contract for the line has been let to the Moore Construction Company of Dallas, Texas, and construction has been started.

Recent completion of a gas line by the Cimarron Utilities Company from Hooker to Tyrone in the Oklahoma Panhandle adds one more town to several in that section that have been given natural gas distribution service within the past year. The gas for these towns comes from wells near Guymon, which town a few years ago was considered hundreds of miles remote from any possible natural gas development.

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The *Tapered*

By LLOYD T. JONES

Physics Department, University of California
*Berkeley, California**

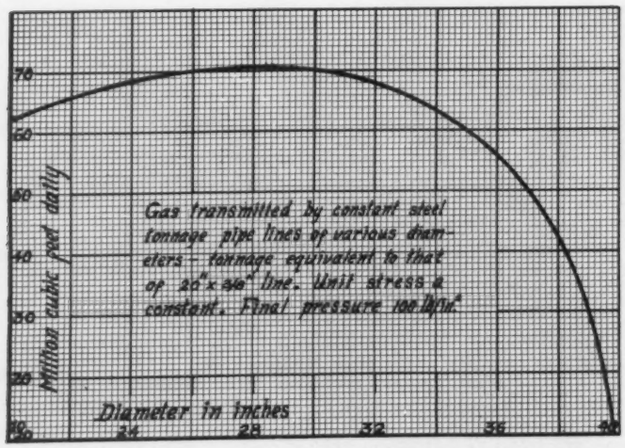


Fig. 1. Merely increasing the pipe diameter and making the metal thinner to maintain constant cost would not greatly augment the flow because the initial pressure of 400 lb/in² abs. for the 20-inch line must decrease as the diameter increases.

TABLE NO. 1

Diameter in inches	Initial pressure in lb/in² absolute	Millions of cubic feet daily Q_2
20	400	62.9
24	277.8	68.4
28	204.1	70.8
32	156.2	68.2
36	123.4	56.3
40	100	0.0

For References See Page 98

THE following is a comparative study of the characteristics of two types of pipe lines (1) the cylindrical line of uniform diameter and (2) the tapered line which increases in diameter as the line proceeds.

The comparison is made on the basis of equality of cost of construction of the two types of line. The tapered line utilizes thinner and thinner metal as the diameter increases, due respect being paid to keeping the unit stress in the steel the same for the tapered line as for the cylindrical one.

The two lines will use identical amounts of steel. The equality of costs is therefore intimately connected with the new type of girth weld.

The derivation of the equations has been given in sufficient detail that those who wish may easily follow the development, including the determination of the constants, and check the calculations. It is hoped that those who do not care to follow the mathematics will not be discomfited by the reasoning given in that language, but will read on and discover that the ideas developed are entirely assimilable without the necessity of thoroughly digesting the symbolic expressions.

Repeated reference is made to Weymouth's equation which was used in the calculations referring to the cylindrical line. Weymouth's expression was taken only for the reason that it seems to be more widely used in the calculation of cylindrical lines. It would have been equally satisfactory to have chosen any other of the many expressions for use as a basis of comparison.

To present the comparison in a numerical manner the calculations refer to a hypothetical 250-mile 20-inch line designed to transport gas from a pressure of 400 pounds per square inch to a final pressure of 100 pounds per square inch. This particular length and diameter were chosen as being representative of lines already constructed. It is obvious that the numerical results can not be of direct service in predicting the characteristics of any line of other dimensions. Each design is a problem in itself. However, all curves shown have been accurately computed and all calculations repeatedly checked.

I wish to express my indebtedness to my colleagues, Professor Walter S. Weeks of the Mining Department of this University, who has freely devoted his time to discussion of this problem, and Mr. H. E. Kennedy, who has aided greatly in producing whatever degree of clarity may be discernible.

THE EFFECT OF FRICTION

In the transmission of gas by pipe line the friction of the gas against the steel of the pipe causes the flow to be lessened in such manner that the gas loses pressure as it proceeds along the line. This friction is dependent on the diameter and length of the pipe. We usually express it by saying that it is proportional to the rubbing surface.

The amount of gas transmitted increases as the area of cross section of the pipe increases. If the diameter of the pipe line be doubled the rubbing surface will be doubled but the cross-sectional area will be four times the original. Without resorting to calculation it is evident that a larger line will transport more gas because the frictional losses are proportionately less as the diameter increases.

It is not so evident, however, that when the diameter is increased we may at the same time proportionately reduce the thickness of the steel, reduce the pressure of the gas to an amount that will not unduly stress the steel and yet transport more than the original amount of gas.

Constructional difficulties preclude the possibility of increasing pipe line diameter at will. Both the butt welded joint and the mechanical joint become less suitable in large diameter thin steel pipe and costs therefore mount rapidly. In mechanical joints leakage is proportional to the diameter. Every pipe line is therefore a compromise design in which the engineer reduces steel tonnage used in construction by the installation of compressor stations to augment the flow.

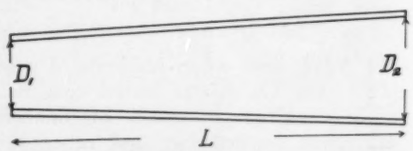


Fig. 2. The tapered line is a frustrum of a conical shell of initial diameter D_1 and final diameter D_2. The steel becomes thinner as the diameter increases.

Quite recently there has been described[1] an improved form of pipe line girth weld. It provides a gas tight line that is free of welding difficulties in construction and operation and effects certain economies as well. Since the cost of the usual girth welds of a pipe line increases approximately as the square of the diameter of the pipe it was to be expected that the greatest usefulness of the new type of weld would be found in transmission lines of relatively large diameter and that its virtues would therefore be most apparent in water pipe lines and transmission

*Presented before the Technical Section of the Pacific Coast Gas Association, March 21, 1929.

Pipe Line *for* Gas Transportation

mains. However, such is not the case. The most profound influence of the new weld will be found in gas transmission lines because of the manner in which it permits economy of transmission.

A pipe line that is designed for the transmission of liquids is not necessarily suited for the transmission of gases. There is a fundamental difference in the phenomena involved.

In pipe line transmission of both liquids and gases it is evident that the frictional resistance of the pipe causes the pressure to drop and gives rise to an hydraulic gradient, or we might generalize slightly and call it a transmission gradient. Now enters the difference between liquids and gases. As the pressure of the gas drops it becomes less dense and must consequently travel with increased velocity, since the same number of pounds of gas per second must pass each point of the line.

If the pressure of the gas falls to half the original value the density falls to half and the gas must travel with twice the original velocity. The frictional force thus becomes four times the original amount. It is evident that the pressure must therefore not be permitted to drop too low. It is more economical to recompress the gas and thus raise its density so that it may travel slower.

The thoughts expressed in the following equations are entirely original and at the time this work was started I was not aware that others[2] too had quite naturally seen the advantage of the tapered gas transmission line.

The difficulties of pipe line construction which usually increase abundantly with increase in diameter have heretofore made the cost of the tapered line prohibitive. After the equation has been derived I shall show the influence of the new girth weld on the cost of the tapered line and how it may now assume its full usefulness.

THE PROBLEM

To make our ideas definite assume that we have the problem of transmitting 50 million cubic feet of gas daily to a city that is distant 250 miles from the gas field. We shall assume that a suitable initial gas pressure is 400 pounds per square inch absolute and that it is necessary for the gas to reach the city at approximately 100 pounds per square inch absolute. Absolute pressures will be used throughout this discussion merely for convenience.

If we utilize Weymouth's formula[3]

$$Q_s = 15385 \left[\frac{(P_1^2 - P_2^2)\, d^{5\frac{1}{3}}}{GTL}\right]^{\frac{1}{2}}$$

p_1—initial pressure, lb/in² abs.
p_2—final pressure, lb/in² abs.
d—diameter, inches.
G—specific gravity of gas relative to air.
T—flow temperature, deg. Fah. abs., (assumed constant).
L—length in miles.
Q_s—cubic feet daily at 60° F., atmos. pressure.

it will indicate the necessity of constructing a pipe line of about 20 inches internal diameter. To withstand the 400 pounds pressure it will be necessary to have the pipe made of about ⅜-inch steel—at least the portion where the pressure is high. The requisite amount of gas may then be transmitted without intermediate compressor stations.

TABLE NO. 2

Initial pressure lb/in² abs.	Final pressure lb/in² abs.	Millions of cubic feet daily 20-inch cylindrical	20-30-inch tapered	20-40-inch tapered	20-50-inch tapered
400	400	00	00	00	00
400	300	42.9	(69.4)	(91.6)	(110.4)
400	200	56.2	(90.9)	(119.9)	(144.5)
400	100	62.9	101.6	134.0	(161.6)
400	50	64.4	104.1	137.4	165.6
400	0	64.9	104.9	138.5	166.9

The values marked ( ) are not available, the final pressure being not permitted to rise that high. The same flow can be obtained by reducing both initial and final pressures.

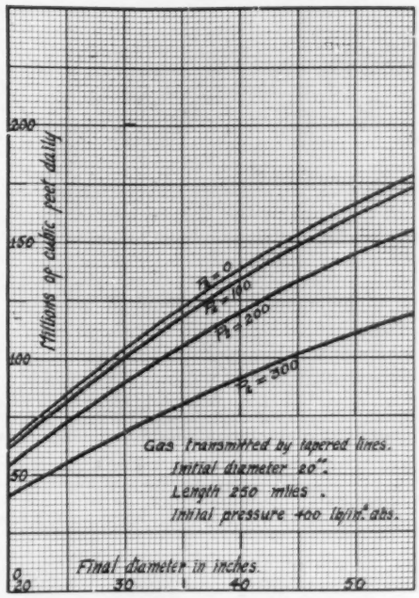


Fig. 3. The curves show the amount of gas transported by various tapered 250-mile pipe lines each having an initial diameter of 20 inches and final diameters indicated as abscissae. The initial pressure in each case is 400 lb/in² abs. Final pressures are indicated by the value P_2 shown on the curve.

But we are confronted with the additional fact that before the life of the line is ended our market will have doubled and we shall have to transport 100 million cubic feet per day. That can be accomplished by the insertion of compressor stations. That it can also be accomplished by the tapered line without additional steel and without the use of compressor stations has not previously been shown.

Since the use of the new girth weld makes the cost of construction independent of the diameter when the steel is proportionately thinned it might seem reasonable to merely increase the whole diameter of the line. It would thus remain a cylindrical line but of larger diameter and correspondingly thinner metal. However, this makes it necessary to reduce the intial pressure and the advantage then gained may be insignificant.

Table No. 1 shows the value of flow that may be expected from the 250-mile 20-inch cylindrical line of our problem and also the values that would result from merely increasing the whole diameter. The values of initial pressure of column two are based on the assumption that the original ⅜-inch steel of the 20-inch line is made thinner as the diameter increases, steel tonnage remaining constant, and the initial pressure is reduced to the amount shown—the unit stress thus being kept constant.

Fig. 1 shows that the flow resulting from thus increasing the diameter reaches a maximum at about 28 inches

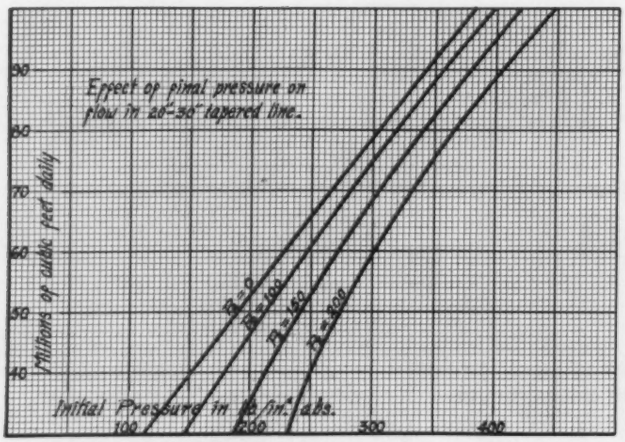


Fig. 4

Fig. 4. The curves show the effect of initial and final pressures on flow through the 20-30-inch tapered line. At an initial pressure of 400 lb/in² abs. and final pressure 100 lb/in² abs. the line will transmit 101.6 million cubic feet daily. Fig. 6. Flow through a 250-mile 20-30-inch line of n steps compared with the flow through the same size line when full tapered.

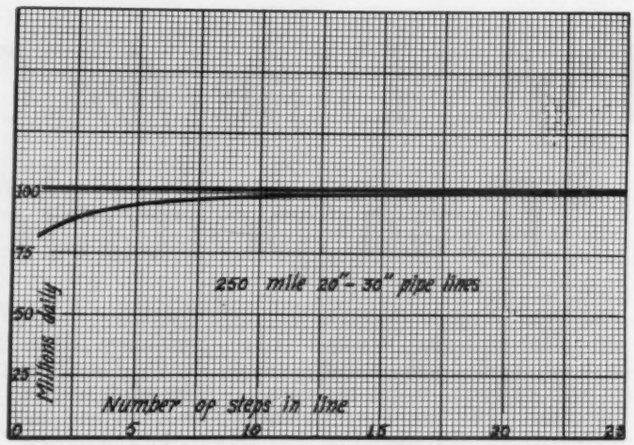


Fig. 6

diameter. The flow must necessarily drop to zero when the diameter is doubled (regardless of actual diameters) because of the fact that the new initial pressure will then have dropped to the value of the final pressure chosen. This curve is accurate only for the values of initial and final pressures chosen for our problem.

EQUATION FOR TAPERED LINE

The pressure drop per unit distance in gas transmission has been found to be proportional to the square of the velocity of the gas and inversely proportional to the diameter of the pipe. This is represented by Fanning's[4] expression

$$-dP = \frac{2f\,\rho v^2\,dL}{D\,g} \qquad (2)$$

dP—pressure drop, lb/ft²
f—friction factor
ρ—density, lb/ft³
v—velocity, ft/sec.
dL—length, ft.
D—diameter, ft.
g—acceleration due to gravity.

The negative sign is taken for dP since pressure decreases in the direction in which we shall later integrate.

The four following expressions whose origin is well known

$$Q = \frac{\pi D^2 v}{4}$$

Q—cubic feet per sec. at initial pressure

$$Q\rho = n$$

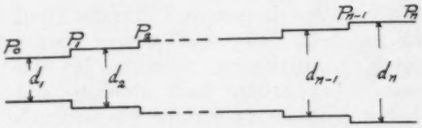


Fig. 5. In practice the diameter of the tapered line would be increased in a series of steps.

n—pounds of gas per second

$$PQ = nRT$$

$$R = \frac{R_a}{G}$$

R_a—gas constant for air,

enable us to substitute values for v and ρ in Fanning's expression.

Equation (2) then becomes

$$-dP = \frac{32 f P G Q^2 dL}{\pi^2 g R_a T D^5}$$

Since $\frac{PQ}{T} = \frac{P_s Q_s}{T_s}$

P_s—standard pressure, 14.67 lb/in²
Q_s—Quantity of gas, ft³/sec. at P_s and T_s
T_s—standard temperature, 520° Fah. abs. (60° Fah.)

equation (3) may be written

$$-P dP = \frac{32 Q_s^2 P_s^2 G T f dL}{\pi^2 g R_a T_s^2 D^5}$$

The friction factor f is known to be a function of the diameter of the pipe. The results of the work of Harris on pipe of 12 inches and smaller diameter show that it may be represented[5] by

$$f = \frac{.008}{d^{1/3}} \quad (d \text{ is in inches!}) \qquad (5)$$

The extrapolation of the curve representing his results to apply to pipe of 20 inches diameter seems justifiable.

Placing this value of f in equation (4) and integrating, with diameter constant, leads directly to Weymouth's equation, (1). In the tapered line the diameter will increase as the line lengthens.

Let the tapered pipe line be as indicated in Fig. 2, a frustrum of a conical shell.

Representing the initial diameter by D_1 and the final diameter by D_2 the diameters and the length are related by

$$D_2 = D_1 + kL$$

Differentiating, $dD = k\,dL$ (6)

where k is a constant. D and dL must both be in inches when substituted in (4) since the diameter in (5) is already in inches.

Substituting (5) and (6) in (4) there results

$$-\int_{P_1}^{P_2} P\,dP = \frac{32 \cdot .008 \cdot 12^4 R_a^2 Q_s^2 G T}{\pi^2 g R_a T_s^2 k} \int_{d_1}^{d_2} \frac{dD}{D^{5\frac{1}{3}}}$$

d_1—initial diameter, inches
d_2—final diameter, inches
P_1—initial pressure, lb/in² abs.
P_2—final pressure, lb/in² abs.
R_a—gas constant for air, 53.34
Q_s—cubic feet per second.

TABLE NO. 3

Number of steps n	Increase in dia. per step inches	Length of interval, miles	Million cubic feet daily Q_s
2	5.0	125	84.2
5	2.5	50	96.2
10	1.11	25	99.2
26	.40	9.6	100.8

TABLE NO. 4

Distance from source in miles	Diameter of pipe inches	Pressure lb/in² absolute	Million cubic feet daily Q_s
50	22	330.6	107.5
100	24	277.8	116.6
150	26	236.7	133.0
200	28	204.1	173.2

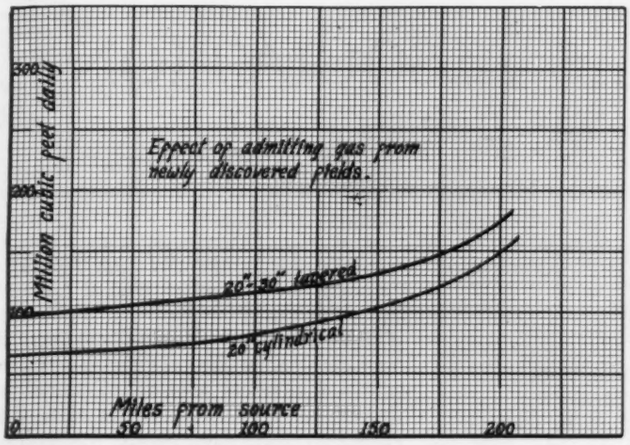


Fig. 7. If gas be discovered at an intermediate point along either the 20-inch cylindrical line or the 20-30-inch tapered line the additional gas may be used to raise the pressure at that point to the full amount for which the lines were designed. The increased flow is nearly the same for each type of line.

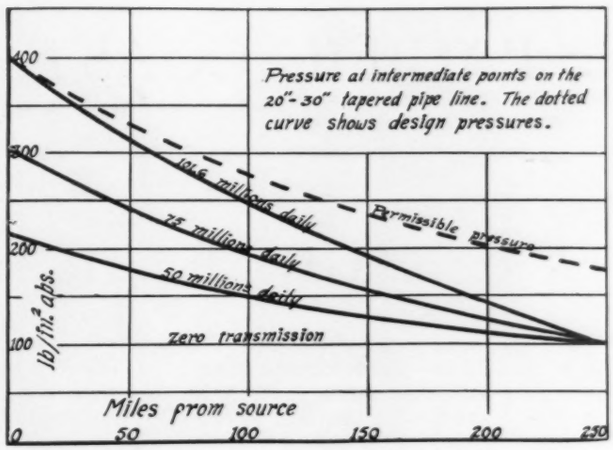


Fig. 8. The 20-30-inch tapered line may be operated at pressures generally lower than its design pressures even while transporting 101.6 million cubic feet daily. The final pressure is indicated as 100 lb/in² abs. for each of the indicated rates of transmission.

The above equation integrated results in

$$Q_s = 8.0507 \cdot 10^6 \left[\frac{k(P_1^2 - P_2^2)\, d_1^{4/3}\, d_2^{4/3}}{G\,T\,(d_2^{4/3} - d_1^{4/3})}\right]^{\frac{1}{2}}$$

Q_s—Cubic feet per day, 14.67 lb/in², 60° Fah.

k—ratio increase in diameter to length, any consistent units.

For the value k=O equation (7) reduces, on evaluation of the indeterminate form, to Weymouth's equation for the cylindrical pipe line. This is ample proof of the validity of the equation.

Now let us apply this new equation to the problem previously stated. We shall choose to enlarge the line from 20 inches diameter and ⅜-inch steel at the source to 30 inches diameter and ¼-inch steel at the city 250 miles distant. Calculating the gas flow and comparing with the flow through the 20-inch cylindrical line we obtain the results shown in Table No. 2.

The values in the fourth column indicate that the uniformly tapered pipe line which increases in diameter from 20 inches at the source to 30 inches at the terminus will transmit 61 per cent more gas than the cylindrical line using the same pressure drop, 400 pounds per square inch initial to 100 pounds per square inch final pressure.

The values in the fifth column show that for the above conditions the line tapering from 20 inches initial diameter to 40 inches final diameter will transmit 110 per cent more gas than the cylindrical line.

SAME AMOUNT OF STEEL IN EACH

In the tapered line one decreases the thickness of the steel in proportion to the increased diameter. The pressure of the gas also diminishes as the distance from the source increases. If the decrease in pressure and the lesser thickness of the steel be properly proportioned the unit stress in the steel will remain constant, as is shown by the following:

The circumferencial stress, T, in a pipe of radius r inches and steel thickness t inches is given by

$$T = \frac{rp}{t}$$

where p is the pressure in pounds per square inch (gage). Inspection of this equation shows that one may increase the radius of the pipe to any desired ratio, decrease the thickness of the steel by the same ratio and yet have the same stress in pounds per square inch provided the pressure is decreased by the square of that ratio.

To be more explicit the 20x⅜-inch steel pipe at a pressure of 400 pounds absolute will have a stress of 10267 pounds per square inch. At the terminus the 30x¼-inch steel at a pressure of 186 pounds absolute will have the same stress, 10267 pounds per square inch. The final pressure will always be kept below this amount.

It seems quite reasonable that most of our line pipe in the future will be longitudinally electric arc welded, for reasons of economical fabrication. If such be the case the cost of fabrication welding of the pipe of the tapered line will be less than that of the cylindrical line, the metal of the tapered line being thinner. Let us hope that this may offset the increased freight cost on the larger diameter pipe. It should, however, be pointed out that freight cost is not necessarily greater for the larger pipe. The tapered line may permit the pipe to be nested for shipment. Costs may even be reduced. Since that is determinable for each project it need not be discussed further here.

The curves of Fig. 3 show millions of cubic feet of gas per day transmitted from an initial pressure of 400 pounds per square inch absolute, and an initial diameter of 20 inches, to a station 250 miles away where it is delivered at the pressure indicated on the curves. Abscissae are final diameter in inches.

Observing the curve for 100 pounds final pressure it is seen that the 20-30-inch tapered line at an initial pressure of 400 pounds will transmit the 100 million cubic feet daily without the use of compressor stations.

It was evident from the values in Table II marked ( ) that gas flow would always need be regulated by adjusting the initial pressure. Values of flow through the 20-30-inch tapered line were calculated for all initial pressures and all final pressures.

The curves of Fig. 4 show that a flow of approximately 88 million cubic feet per day may be obtained between initial and final pressures 400 and 200 respectively or between 350 and 100. The operator naturally chooses the pair of values placing the least stress on the line.

FIELD CONSTRUCTION

The tapered line will cost more to protect from corrosion. Should it be necessary eventually to excavate and repaint the pipe that cost would favor the cylindrical line. It is hardly conceivable, however, that the increased cost of painting could compare with the construction and operation of a compressor station.

The necessity of utilizing the usual weld or a mechanical joint on the tapered line would preclude its extensive use.

(*Continued on Page 96*)

PACIFIC COAST GAS ASSOCIATION

447 Sutter Street, San Francisco, California

A Department Conducted by Clifford Johnstone, Executive Secretary

Victoria Gas Men Hosts *in* June

AS the April issue of *Western Gas* reaches our members, the Northwest Regional Conference at Victoria on June 7 and 8 is on the point of convening.

This meeting is annually becoming more and more popular and is developing many of the characteristics of a real convention. Attendance is expected from all points in the Northwest states and will include a number from California.

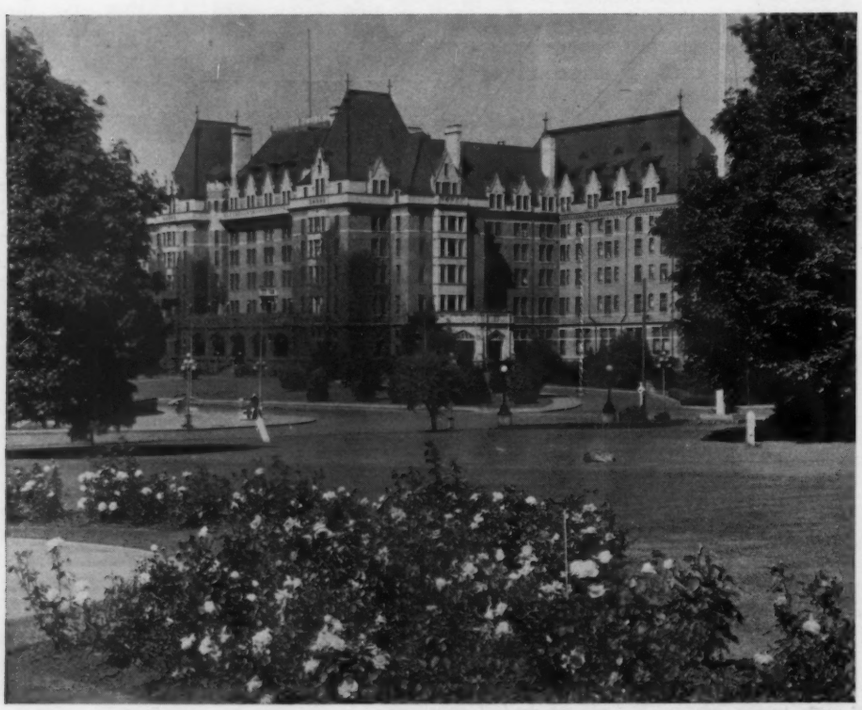
Headquarters will be established at the Empress Hotel, which has a marvelous location in the center of the city.

Features of the meeting will be a luncheon program at noon on the first day, and a dinner dance without any speakers on the evening of the same day. An opportunity will be given for golf and sight-seeing Saturday afternoon, and as the meeting will close Saturday noon, many visitors will undoubtedly spend the week-end on beautiful Vancouver Island.

The business program for the meeting is almost complete and will be mailed to all members of the Association early in May. Every effort is being made to have adequate discussions on the problems of Load Building, so important now to the gas industry, and in addition there will be discussions on matters of importance to all gas men, irrespective of the department in which they work.

F. H. Hewlings

The Victoria organization of the British Columbia Electric Power and Gas Company, under the leadership of Mr. F. H. Hewlings, is planning a program and entertainment for this meeting which will long be remembered by those fortunate enough to attend.



Empress Hotel, Victoria, B. C.—Northwest Headquarters for P.C.G.A., June 7-8

Los Angeles Meeting of Commercial Section

CLOSE to one-hundred members of the Pacific Coast Gas Association attended a meeting of the Commercial Section at Hotel Alexandria, Los Angeles, on Monday, April 8th. The meeting started with a luncheon at 12:15 o'clock and at one o'clock, Clyde H. Potter, chairman of the Commercial Section, opened the program.

Several past presidents, directors and officials of the Association, made brief remarks at the opening of the program. Among them F. J. Schafer, F. S. Wade, H. R. Masser and N. R. McKee, all of them stressing the need for more sales work on the part of the gas company.

Frank H. Bivens, vice-president of the Association and vice-president of the Southern Counties Gas Company, presented an address on "The Importance of Sales." Mr. Bivens spoke at length on the great need for selling approved appliances on the part of the industry, pointing out that this is a competitive era in which "industry is pitted against industry."

He pictured several interesting episodes in the early days of the Denver company when gas ranges were introduced, describing the methods employed to place these "new" appliances in the homes of the skeptical consumers. He carried this story down to the present day, showing how the engineer, the financial man and the accountant had accomplished a splendid job, but, he concluded, "the era of modern merchandising methods is upon us. We must put our house in order to meet the changing conditions of today."

Following Vice-President Bivens' talk E. M. DeRemer, of the Southern California Gas Company, presented a film showing a number of heat treating furnaces installed by that company on its lines. Mr. De Remer explained the film as the various scenes were shown. This unusual feature created a great degree of interest among the commercial and industrial men present. Mr. De Remer's talk was discussed by C. L. Ferry, power engineer of the Southern Counties Gas Company.

The next speaker was D. L. Leahy, of the Southern Counties Gas Company, who presented a valuable contribution

(*Continued on Page 100*)

Public Relations Section Convention Activities

MR. F. E. SEAVER secretary of the Los Angeles Gas and Electric Corporation, and Mr. J. F. Pollard, division manager of the Pacific Gas and Electric Company, who were recently appointed by Chairman A. E. Holloway of the Public Relations Section to take charge respectively of the Essay and Public Speaking contests which will culminate at the September convention at Del Monte. have both been busy perfecting their plans.

The Essay contest will be the first sponsored by the Pacific Coast Gas Association. Both contests will take for their theme "Gas is Better" and will encourage elimination contests to be held in each local company organization prior to the convention. The idea behind these contests, of course, is not so much the convention presentation as it is to encourage gas company employees to think.

For the Essay Contest, local company directors have already been appointed and announcements will come through them probably about May 1. Each local contest director will judge, mark

(*Continued on Page 100*)

Legislation and Taxation Committee Complete

Geo. L. Myers, chairman of the Committee on Legislation and Taxation, announces the completion of his committee personnel as given below, one representative being included from each state within the Association's territory.

On the committee are:

Arizona, Edward H. Coe, Central Arizona Light and Power Company, Phoenix; California, C. P. Cutten, Pacific Gas and Electric Company, San Francisco; Idaho, W. W. Flanders, Public Utilities Consolidated Corporation, Pocatello; Nevada, George A. Campbell, Sierra Pacific Electric Company, Reno; Oregon, Geo. L. Myers, Portland Gas & Coke Company, Portland; Washington, C. Y. Bowers, Washington Gas and Electric Company, Longview; and British Columbia, James Lightbody, British Columbia Electric Power and Gas Company, Vancouver.

100 Per Cent Membership

Through the action of the Spokane Gas and Fuel Company in recently renewing its company membership in the Association, the state of Washington now has the honor of standing among the first in its support of the Pacific Coast Gas Association. Every gas company in the state is a company member.

Nevada and British Columbia are also 100 per cent, while Oregon comes next with only one non-member company. Arizona has two company members out of a total of five companies. Idaho has two members out of four companies, and California 13 out of 17.

Convention panorama of delegates at Tucson meeting of Arizona Utilities Association

Successful Arizona Meeting at Tucson, April 18-20

THERE is something in the Arizona air which bespeaks of hospitality and romance, as everyone will agree who was fortunate enough to attend the recent highly successful convention of the Arizona Utilities Association in Tucson.

The entire facilities of the new El Conquistador Hotel were reserved for the occasion and it seems that almost the entire gas and electric population of Arizona was there, together with a generous representation from California and other adjacent states.

A great deal of credit is due Mr. Max Pooler, president of the Association and vice-president and general manager of the Tucson Gas, Electric Light & Power Company, and Mr. Lee C. McCullough, secretary of the Association, for the excellence of the arrangements. Mr. Claude H. Webber of the Tucson company, and his charming wife arranged many of the entertainment details, and in fact the entire Tucson organization can qualify as being perfect hosts.

The business program was excellently arranged, and on it the gas industry was represented by Captain A. E. Higgins, field representative of the American Gas Association, and by Mr. Clyde H. Potter, commercial manager of the Southern Counties Gas Company, Los Angeles, and chairman of the Commercial Section of the Pacific Coast Gas Association. The electrical industry was represented by Mr. Paul M. Downing, president of the Electrical Association and vice-president of the Pacific Gas and Electric Company, and by Mr. E. B. Chase, illuminating engineer of the National Lamp Works. Mr. George Lewis, director of the Rocky Mountain Committee on Public Utility Information, discussed very ably from first hand knowledge the trend of the investigation of public utilities being conducted by the Federal Trade Commission, and Mr. Jack S. Arnold of the Central Arizona Light and Power Company at Phoenix, described the publicity and advertising methods of that company, which have achieved such excellent results as to have been commented on throughout the West.

Mrs. Ruth E. Creveling, chairman of the Women's Committee of both the Pacific Coast Gas Association and the Pacific Coast Electrical Association, appealed for greater support to the Women's Committee movement, and there can be no doubt but that all who heard her were convinced of the value and usefulness of the work so ably led by Mrs. Creveling.

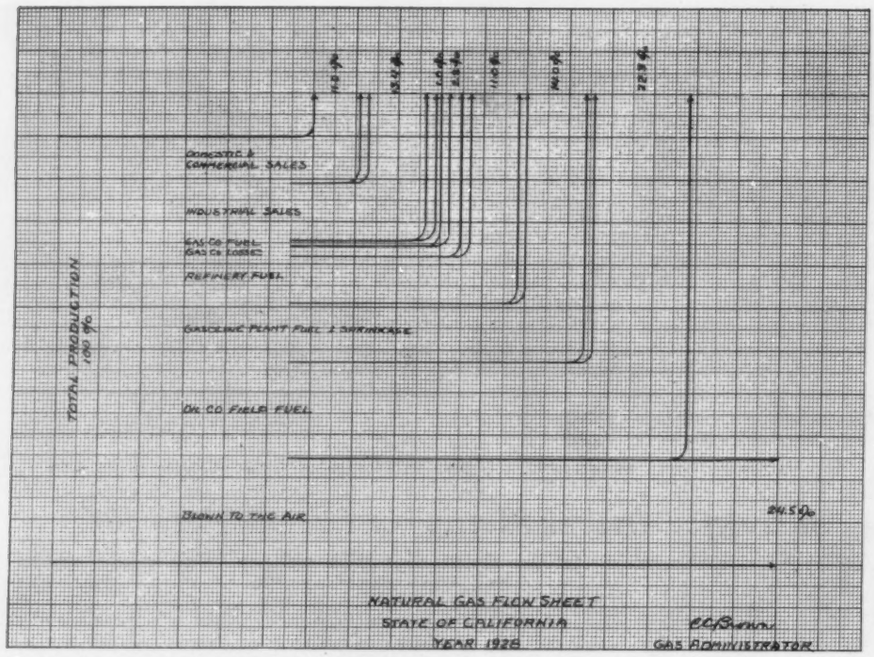
Another very interesting feature of the program was the final judgment on Public Relations essays, the prize being a trip to the Del Monte Convention of the Pacific Coast Electrical Association. This contest was won by Wilma D. Jones and Irene Wolcott of the Arizona Edison Company at Bisbee.

The afternoon of Friday, April 5, was devoted to the annual Golf Tournament in which Mr. Paul M. Downing carried away the honors with the low net score and Mrs. Downing the honors in the ladies' putting contest.

On Saturday afternoon, April 6, following the final session, a trip was made to the Hacienda de la Arivaca—one of the largest remaining cattle ranches of the West, over 25 miles in length and containing some 300,000 acres—for a barbecue lunch and rodeo, which proved very interesting and novel entertainment feature.

New officers elected to head the Association for the coming year are: L. V. Sears, Prescott, president; A. L. Moriarity, Phoenix, vice-president; Milton

(*Continued on Page 100*)



California Natural Gas Totals for Year 1928

Compiled

By CLAUDE C. BROWN

Gas Administrator, Railroad Commission, State of California

CALIFORNIA NATURAL GAS STATISTICS BY MONTHS FOR THE YEAR 1928

Guide to Tabulations Below

1. PRODUCTION
   - A. Production from wells in State....Total Monthly M.C.F.
   - B. Imported from other States.....Total Monthly M.C.F.
2. UTILIZATION
   - A. Used for Domestic and Commercial Sales .....Total Monthly M.C.F.
   - B. Used for Carbon Black Production .....Total Monthly M.C.F.
   - C. Used for Other Industrial Sales....Total Monthly M.C.F.
   - D. Used for Field and Plant Fuel, Pumping shrinkage, etc. .....Total Monthly M.CF.
   - E. Used for transportation to other States or Countries .....Total Monthly M.C.F.
   - F. Unaccounted for Losses.....Total Monthly M.C.F.
   - G. Average number of consumers (monthly) .....
3. WASTAGE
   - A. Blown to the atmosphere.....Total Monthly M.C.F.
4. GENERAL
   - A. Late representative chemical analysis of gas, including heating value and specific gravity.

	January	February	March	April	May	June	July	August	September	October	November	December	Total	%
1. PRODUCTION														
A.	22,932,161	21,568,693	22,578,251	23,217,763	25,353,763	26,237,451	27,172,132	27,479,623	27,026,596	29,177,119	30,673,269	33,413,326	316,830,147	100.0
B.	0	0	0	0	0	0	0	0	0	0	0	0	0	
2. UTILIZATION														
A.	4,467,326	3,900,024	3,515,836	2,907,558	2,423,939	2,122,356	1,893,724	1,756,443	1,834,611	2,351,674	3,277,644	4,354,418	34,805,553	11.0
B.	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
C.	3,097,972	3,026,086	3,414,740	3,366,362	3,243,385	3,481,624	3,578,515	3,943,298	3,958,950	4,063,297	3,772,223	3,699,530	42,645,982	13.4
D.	10,479,778	10,093,212	10,467,697	11,359,980	13,186,524	13,869,643	13,147,700	14,130,536	14,062,653	14,128,835	13,851,468	14,230,937	153,008,963	48.3
E.	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
F.	715,481	583,975	896,067	436,174	613,907	487,956	553,276	554,093	637,716	1,085,851	895,270	1,319,159	8,778,925	2.8
G.	697,961	700,610	699,384	696,245	692,541	687,976	686,964	688,631	696,016	705,963	717,149	725,460	699,575	—
3. WASTAGE														
A.	4,171,604	3,965,396	4,283,911	5,147,689	5,886,008	6,275,872	7,998,917	7,095,253	6,532,666	7,547,462	8,876,664	9,809,282	77,590,724	24.5
4. GENERAL	CO_2	O_2	CH_4	C_2H_6	N_2	S. G.	B.T.U./Cu. Ft.							
A.	3.3	0.0	69.8	25.7	1.2	0.65	1157.0							

NATURAL GASOLINE PRODUCTION STATE OF CALIFORNIA FOR THE YEAR 1928

Months	Natural Gas Treated M. C. F.	Natural Gasoline Produced Gallons
January	25,770,084	43,409,396
February	24,259,503	40,610,133
March	25,465,430	44,262,521
April	25,830,544	45,493,157
May	27,976,765	48,791,092
June	28,391,950	48,579,983
July	31,057,630	49,029,191
August	30,496,052	50,081,709
September	29,884,159	46,570,917
October	30,830,885	51,994,348
November	31,402,786	52,050,798
December	34,486,491	54,694,153
Total	345,852,279	575,567,398

GAS-FIRED JAPANNING OVEN INSTALLED AT VANCOUVER

Gas is now playing a part in the production of electrical products at Vancouver, B. C. A gas-fired jappaning oven built according to the instructions of J. A. Thomson, industrial gas department, B. C. Electric Railway Company, has been installed at the plant of the Electric Panel Manufacturing Company.

The oven is used for baking japan on panels and switchboard fittings of various colors, each color requiring a different temperature to obtain the desired finish.

ELK CITY-CARTER PIPELINE RECENTLY COMPLETED

The Central States Power & Light Corporation has completed construction of a 6⅝-inch gas transmission line between Elk City and Carter, Oklahoma, connecting to wells in the Sayre field. Cost of the line was approximately $125,000.

ENGLEWOOD, COLO., GRANTS NATURAL FRANCHISE

Englewood, Colorado, recently granted a franchise to the Public Service Company of Colorado for the service of natural gas.

GAS ENGR. SHORT COURSES TO BE OFFERED AT U. OF ILL.

A short course in gas engineering will be offered at the University of Illinois, June 17 to 29, 1929. The course will be known as the Fourth Short Course in Gas Engineering and will be under the direction of Dr. T. E. Layng, of the University of Illinois staff.

The course this year is to be different in many respects from those of preceding years. Industrial, hotel and restaurant, and house heating subjects will be handled as usual, but the rudimentary work on combustion, chemistry and physics is to be spread out over a greater number of days than before, thus giving the students more of an opportunity to digest this part of the work.

The course is sponsored by the Illinois Gas Association, and is under the direction of the following committee: J. D. Preble, The Public Service Co., chairman; W. B. Swearingen, Central Illinois Light Co.; A. D. Frydendall, The Peoples Gas Light and Coke Co.; J. R. Roberts, Rockford Gas Light and Coke Co.; and R. D. Hayes, Illinois Power and Light Corp.

P. G. AND E. CO. INSTALLING NEW DISTRIBUTION EQUIPMENT

Contract has just been awarded to the Elliott Company of California, for one motor driven and one turbine driven blower to be installed at the Vallejo, California, plant of the Pacific Gas and Electric Company. These new blowers are of 12,000 feet per minute capacity and are being used to replace smaller equipment to take care of the needs of the new 50,000-foot generator now under construction, as well as the old generators. A small turbine driven booster is later to be installed at the same plant.

The four new turbine driven gas boosters, two for the Oakland and two for the Potrero plants of the Pacific Gas and Electric Co., will be purchased from the Elliott Company of California. These boosters have a capacity of a million cubic feet per hour each.

SAGINAW-NEOSHO GAS LINE IS COMPLETED

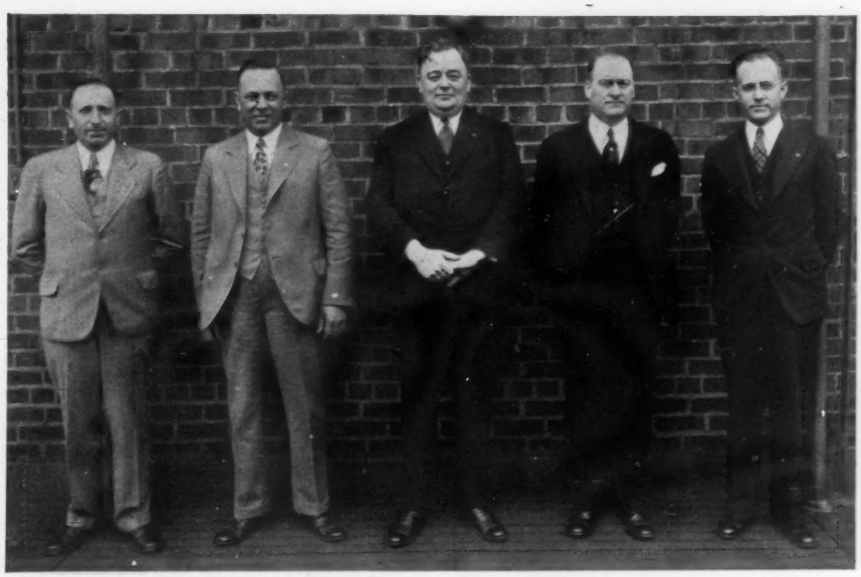
Work was completed recently on the construction of 15 miles of welded gas pipeline which connects with the main line of the Cities Service Gas Company at Saginaw, a short distance south of Joplin, Missouri, and extends in a southeasterly direction to Neosho. Gas will be available for both industrial and domestic consumption as soon as the supply line has been blown and tested. Construction of the town border regulating and measuring station at Neosho, Missouri, was completed April 6.

EAST BAY CITIES MAY REQUIRE PERMITS FOR HEATING JOBS

Several cities in the East Bay and Oakland districts of Northern California are drafting local ordinances to require permits for all heating jobs to be installed, according to recent report. The cost of the permits will probably be $1.00 for floor furnaces and other small heating pobs, and $2.00 for basement furnaces.

PUBLIC UTILITY INFORMATION BUREAU MOVES OFFICES

The Louisiana-Mississippi Committee on Public Utility Information has moved its office to 826 Hibernia Bank Building, New Orleans.



Officers of the Mid-West Gas Association. From left to right: Louis Stein, retiring president; E. H. Vieregg, newly elected president; John M. Drabelle, first vice-president; J. K. Swanson, second vice-president; R. B. Searing, secretary-treasurer.

Mid-West Gas Men *in* 24th Meet

THE 1929 convention of the Mid-West Gas Association, held on April 15, 16, and 17, realized the expectations of its members for an interesting session. Members from the states of Iowa, Nebraska, Minnesota, and North and South Dakota, gathered in Minneapolis, Minnesota, for the 24th Annual Convention of the Association.

Officers to serve the Association for 1929 were elected at the first general session, and are as follows: E. H. Vieregg, Grand Island, Nebraska, president; John M. Drabelle, Cedar Rapids, Iowa, first vice-president; J. K. Swanson, Minneapolis, second vice-president; and R. B. Searing, Sioux City, Iowa, secretary-treasurer.

Members of the council elected are: W. E. Derwent, Rockford, Illinois; C. C. Hellmers, Lincoln, Nebraska; James Trimble, Bismark, North Dakota; L. W. Wade, Fort Dodge, Iowa; R. H. Garrison, Waterloo, Iowa; R. L. Klar, Des Moines, Iowa; H. R. Schmidt, St. Paul, Minnesota.

A unanimous vote was taken by the Association to begin an active advertising campaign in the middle west.

Hon. George E. Leach, Mayor of Minneapolis, gave the address of welcome to which J. K. Swanson, vice-president of the Minneapolis Gas Light Company, responded. The President's Address was given at the afternoon session of April 15. Tuesday morning was given over to sectional meetings, where papers were read and discussions held. At the afternoon session Major Alexander Forward of New York, managing director of the American Gas Association, spoke, taking for his subject "Running and Reading." The morning session on April 16 featured the technical section of the American Gas Association, at which A. Gordon King, service engineer for the Association, spoke on "Checking Up the Prophets."

R. E. COMBS GETS FRANCHISE IN SUNNYSIDE, WASH.

A franchise has been granted to R. E. Combs for the service of natural and manufactured gas in Sunnyside, Washington. The permit gives the right to operate and maintain a gas plant and distribution system, provided that construction work starts within six months. Pasco, Washington, has also granted Mr. Combs the gas franchise in that city, and Kennewick, Washington, is considering his application for the privilege of serving the town.

E. A. WESTON IS ACTING MGR. OF COMPANY AT NOGALES

Earnest A. Weston was recently appointed acting manager of the Nogales office of the Public Utilities Consolidated Corporation. Mr. Weston, who has held the position of superintendent of the Nogales office since last October, takes the place of Tom Pitts, who resigned the middle of April.

CARL WYKOFF IS NOW WITH GREELEY, COLO., GAS CO.

Carl Wykoff, who has been connected with the house-heating department of the Public Service Company of Colorado, with headquarters in Denver, Colorado, has been appointed new business manager of the Greeley Gas Company of Greeley, Colorado. Mr. Wykoff was formerly manager for the Mobile Gas Company at Mobile, Alabama, and before going to Denver, was manager of the Emporia Gas Company of Emporia, Kansas.

H. L. DICKERSON ACCEPTS IMPORTANT POST

H. L. Dickerson has been named assistant general manager of the United Gas Engineering Company of Houston, Texas. Mr. Dickerson will assist A. C. Howard, vice-president and general manager of the company, which is the engineering subsidiary of the United Gas Company.

With *the* Metermen

The Papico Orifice Meter Flange Assembly

AT BEST a measurement can only be as accurate as the device used to make that measurement. Inaccuracies in an orifice meter or in the tubes leading to it are particularly objectionable because they influence measurement when the flow is computed. Without care, forethought and proper selection it is impossible to assemble standard pipe and fittings into a flow meter wihch will give uniform results.

By ARLAN E. DEBURN
*Pacific Pipe & Supply Company**

In order to see just what difficulties must be overcome let us go briefly into the manufacture of pipe. Lap weld pipe is made from flat sheets of steel, called skelp, long enough to make a finished length approximately 20 feet long, and the proper width to have the edges lap for welding when the skelp is rolled longitudinally to the desired diameter. The skelp is heated, rolled into a rough cylindrical form, returned to the furnace, brought to a welding heat, and then run through the welding rolls. These rolls, one above the other with concave surfaces, form an opening of just the outside diameter of the pipe to be manufactured. Held directly between the concave surfaces of these rolls is the "Ball" which corresponds to an anvil in the usual blacksmith forge welding operation. That is exactly what takes place in the manufacture of lap weld pipe, forge welding. The Skelp is compressed by the concave rolls against the anvil ball and a continuous forge weld takes place along the overlaping beveled edges.

From this it is evident that the operation is rough in the extreme, with chance for considerable irregularity of diameters. The further process of manufacture deals with the sizing, straightening, threading and testing. The benefits of sizing and testing can readily be seen, but the threading introduces another point.

As threads are external and must be uniform, the manufacturer is concerned with the *external* diameter of the finished pipe. As we who use pipe for flow measurement purposes are only interested in the *internal* diameter, it is necessary for us to use extreme care in pipe selection to overcome this lack of internal diameter exactness on the part of the pipe mills. Our problem is two-fold in that we must overcome the manufacturer's rough forging operation and also his tendency to concede to the general pipe users demands for accurate external dimensions rather than to the needs of the orifice metermen for an exact internal diameter. In selecting pipe as near the nominal inside diameter as possible for use as flow tubes, in the Papico Orifice Meter Flange Assembly, our shop inspector examines and micrometers the inside of each length of every shipment we receive for accurate flow tube material. The micrometers are used near each end of each length and also an arms length inside the pipe for uniformity. Four separate readings across the diameter at four different places determine whether the length is suitable to be placed in the select orifice meter stock or relegated to the regular pipe rick.

VAN STONE LAP

The Van Stoning operation is the next step, in which an integral lap is formed on one end of each length. This method of preparing a gasket face joint gives a smooth, even, internal diameter of the pipe up to the square corner of abutment against the gasket and orifice plate. There can be no recess adjacent to the orifice plate such as is formed when a threaded flange is not screwed on flush. The Van Stone Joint eliminates all possibility of a thread leak because it eliminates all threads.

The rolling of the lap is followed by a thorough annealing operation, after which the pipe is again micrometered to see that the same internal diameter has been pre-

*Presented before the Southern California Meter Association, March 28, 1929.

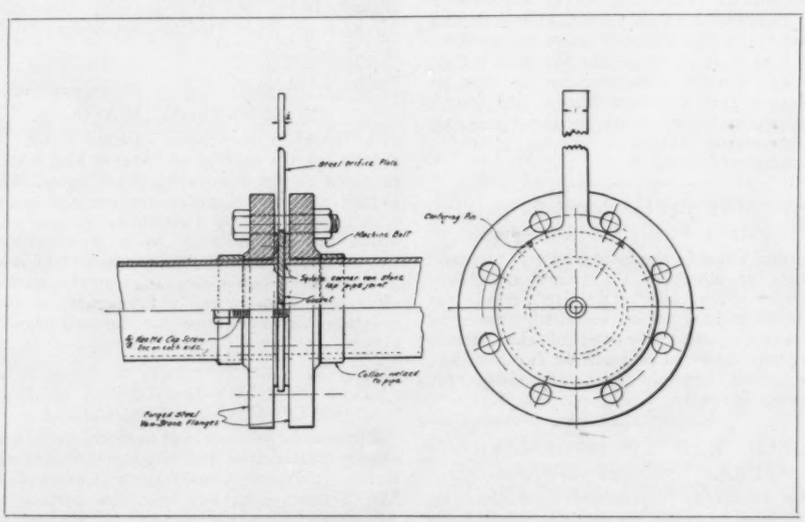


Diagram of Papico orifice meter flange assembly

S. C. Metermen *in* Session April 25

THREE papers made up the April program of the Southern California Meter Association. Following the monthly dinner, which began at seven o'clock, April 25, at the Rio Hondo Golf Club near Downey, California, the business program opened at eight o'clock.

President B. M. Laulhere introduced T. K. M. Smith of the Industrial Fuel Supply Company, and first president of the Association, who read an interesting paper on "Mercury Traps." Mr. Smith's paper was accompanied by stereoptican illustration, and by a meter set-up to which a mercury trap was connected for the purpose of demonstration. General discussion followed the presentation of this paper.

C. E. Pickup of the Southern California Gas Company, was next on the program with a discussion of "Geology." Mr. Pickup's discussion of this topic had particular reference to formations in the Los Angeles basin. It was profusely illustrated with slides covering various ages in the geological history in that section.

"Square Root Chart Applications for Use With Orifice Meters," was the subject of J. J. Delaney's paper, which concluded the program. The paper by Mr. Delaney, who is with the General Petroleum Corporation, was also illustrated with slides.

During the business program at the April meeting four members were admitted to the Association. Malcolm Miller, chairman of the entertainment committee, announced prize winners for the monthly golf tournament held on April 21. H. C. Wood of Neilan Schumacher Company won first prize, a $10 merchandize order, the personal gift of J. Simon Fluor. Second and third prizes were presented through the courtesy of Neilan Schumacher Company, and went respectively to W. H. McPherson and H. G. Andrews. They were merchandise orders for $7 and $5. Cash sweepstakes went to E. H. Pann and F. E. Huff.

Announcement was received from E. N. Brown, chairman of the Association's standards committee, that the first distribution of data sheets for the members' loose leaf handbooks will be made at the May meeting.

served. If so, it is then set up in the lathe for the machining operation. The face of the lap is given a gasket face finish, the outside diameter is turned to dimensions specified for the raised face of the corresponding I.P.S. flange and the back of the lap is machined parallel to the face. As this is an all-lathe job the lap must necessarily finish perfectly square with the axis of the pipe and the outside diameter of the finished lap must be concentric with the center line of the pipe. This latter point may be used to help center the orifice plate, which will insure the placing of the orifice in the exact center of the line. The backfacing of the Van Stone lap insures an even bearing surface for the loose bolt flanges and an equal pressure on the gasket faces as the bolts are uniformly drawn up in assembly.

In order to complete the joint ready to receive the bolts the loose ring type flanges are slipped on, one of these flanges having first been tapped for the casehardened jack screw. The backing up collar is then placed behind each loose flange and spot welded by the electric arc method. This is to take up the thrust in the line when pressure is brought to bear by the jack screws to spread the laps for the changing of orifice plates.

It is our standard practice to place the differential piping couplings 2½ pipe diameters up stream and 8 pipe diameters down stream from the orifice plate. A ½-inch hole is drilled through the pipe wall and the coupling is then arc welded over this hole. The final operation is the insertion of an under cutter reamer which removes any boring burrs which may have adhered to the inner wall of the pipe from the drilling operation. The electric arc method of welding is used entirely, as we find that its concentrated heat has no tendency to warp the pipe or change the internal diameter. In applying welding to the backing up collars we use the skip method so that there can be neither concentration of heat, nor progression of stress to any one point.

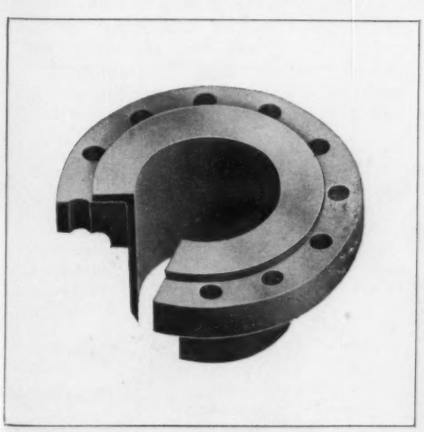
Before shipment these flow meter flange connections must pass a rigid inspection. After all machined parts are painted to avoid any chance of rust the pipes are again closely micrometered at six places across the diameter and the average of these readings to three decimal places is stamped into the outerwall of the pipe adjacent to the flange and on a line with the differential couplings. Consequently, if one desires to gain extremely accurate results he may easily locate these markings and figure a co-efficient for the exact diameter of the pipe instead of using a co-efficient that has been figured from the nominal inside diameter.

We are not overlooking the fact that seamless tubing may, in time, from its method of manufacture, prove to be the proper material to use for meter runs. Modern pipe mills are making tremendous strides with seamless, and orifice meters will benefit as soon as practicable.

The advantage of the Van Stone joint with its square inner corner, reinforced cross section at the lap angle, and loose ring flange are readily recognized. The Papico Van Stone laps have the following features: First: Every lap is annealed after the upsetting process, which relieves any chance of cold working or other stresses and promotes grain refinement. Second: Every lap is backfaced. This gives a perfect bearing surface for the flange, without chance of wobble and distributes even pressure to the gasket. These points are important for dependability, long life, and freedom from gasket troubles.

Now the jacking apart arrangement for the changing of orifice plates: One of the steel Van Stone flanges is tapped for two set screws so as to place them opposite each other on the regular bolt circle. These are long enough to extend past the orifice plate and against the opposing flange, also of steel. As the set screws are screwed in they act as jacks, pushing the flanges apart. The loose ring flanges would naturally slide up their respective lengths of pipe were it not for the steel collar welded behind each one to take up the thrust, in turn transferring this force to the walls of the pipe and drawing the lap joint apart.

(*Continued on Page 98*)



Showing Van Stone flange detail

Typical Papico assembly

Errors *in* Printing Orifice Meter Charts

By GEO. H. BRIGGS

*Los Angeles Gas and Electric Corporation, Seal Beach, California**

A MATTER of interest to metermen handling orifice meter charts lies in the opportunity for error introduced as a result of small inaccuracies in the printing of these charts.

At the Seal Beach plant of the Los Angeles Gas and Electric Corporation an investigation has recently been conducted with a view to determining whether such errors in printing were actual, and if so, of how great degree.

There had been noted certain small discrepancies which could most conveniently be explained on the basis of improper printing. But because it did not seem reasonable that a printing error should exist it was decided to settle the matter in a way that would be definite.

The method chosen was purely mathematical, as any other method seemed certain to introduce complications, or inaccuracies, or both, and thus obscure the results.

The first step in carrying out the investigation was to ascertain with great accuracy the diameters that the various circles of a typical chart should have. The second was merely precise measurement of a number of charts, and calculations to eliminate the error due to shrinkage of the paper since time of printing. The third and last was an analytical comparison of the diameters as measured, with the diameters as established mathematically.

The mathematical part of the problem was found to be considerably more complicated than was anticipated, but was eventually resolved to a formula of reasonable simplicity, that was general enough to apply to prac-

*Presented before the Southern California Meter Association, February 28, 1928.

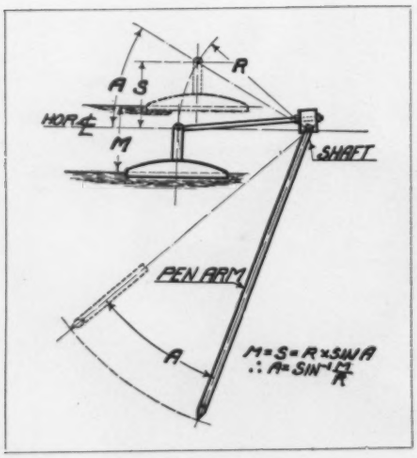


Fig. 1

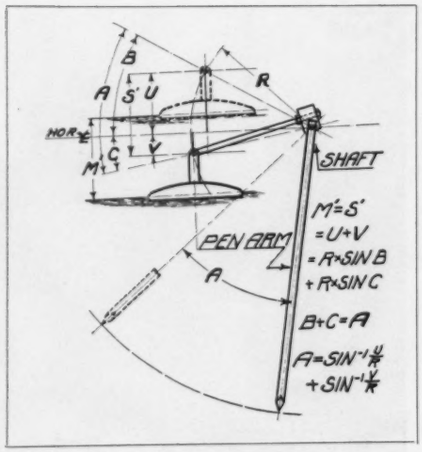


Fig. 2

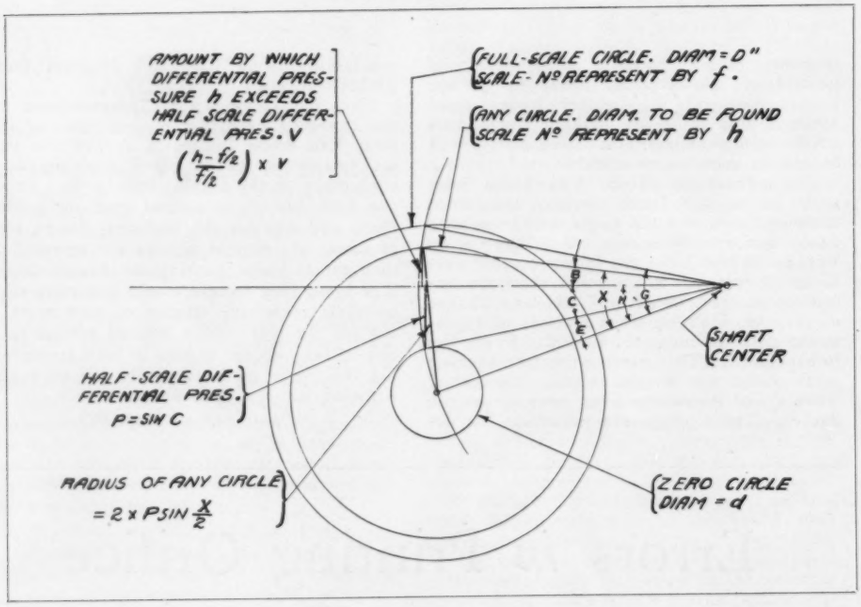


Fig. 3

tically all circular charts of the flow meter type under investigation. The same can be said of the analysis of the principle underlying the divisions of the chart, for this also tended, at first, to become awkward.

FORMULA

$$38 \times \text{Sin}\left[\frac{19°26'45'' - \text{Sin}^{-1}\left(\frac{2h-f}{5.20856f}\right)}{2}\right]$$

Where:
h = scale No. of circle.
f = scale No. of full-scale circle.

It therefore seems appropriate that these formulae should be reported to this Association, so that any members who might in the future desire to investigate along similar lines could be saved considerable labor and have something against which to check.

In the type of meter under investigation, a body of mercury rises and falls in response to a differential pressure, maintaining at all times a static head of mercury that is the exact equivalent of that pressure. Upon one of the surfaces of this mercury a float rides and, by connection through a float arm, imparts rotative motion to a shaft which, in turn, controls the motion of a pen-arm and pen.

Consideration of the construction of such a meter will make it evident that the rotation of the shaft, and therefore the movement of the pen, must be related to the movement of the mercury surface in the manner that angles are related to their sines; that is, the relation is not a simple, direct one, and therefore equal changes in the position of the mercury surface will *not* produce equal changes in the position of the pen.

Referring to Fig. 1, if the mercury level rises by the amount M, the float must rise by the same amount, or S, and turn the shaft through the angle A. A study of the figure will show that the angle A may be identified as the angle whose sine is the fractional quantity resulting from a division of the length S by the center-to-center length of the float arm. In this figure, the upper end of the float stem (when the float is in its lower position) is, by construction, on the horizontal center line drawn through the center of the shaft.

If the lower position of the float is such that the upper end of its stem falls below this center-line, then the center-line divides the angle A into two lesser angles which must be identified individually; and a more complicated relation exists between the angular motion of the pen and the vertical displacement of the mercury surface.

Referring to Fig. 2, if the mercury level rises by the amount M', the float must move by the amount S', which is the sum of the two lesser amounts U and V. The angle A is, in this case, the sum of the two lesser angles B and C;—B being identified as the angle whose sine is U divided by R, and C being identified as the angle whose sine is V divided by R. The base-line for both angles must be the horizontal center-line through the shaft center.

In Fig. 3, the machinery of the meter is omitted, and certain adjustments of construction resorted to, to obtain simplicity. The angle A of the pen-arm has been revolved about the shaft center until it coincides with the angle A of the float-arm; and the length R of the float-arm has been increased to equal the length P of the pen-arm. This is permissible as it has no effect upon the problem, its accuracy, or the answer.

Figure 4 shows the development of the general formula which appears below. It is segregated from Fig. 3 for simplicity.

To ascertain the correct diameter of any circle of any such chart, all that need be known is the length of the pen-arm (or P), the diameters of the full-scale and zero-scale circles (or D and d) and the scale-numbers of the circles D and X.

(The scale-numbers are the numbers printed on the charts adjacent to these cir-

TABLE NO. 1

1 Scale No. of circle	2 Mathematical diameter inches	3 Diameter as measured inches	4 Printing error inches	5 Gas Flow Error due to incorrect reading
100	10.0000	10.0000	+.0000	—.000%
90	9.2835	9.2837	+.0002	—.001%
80	8.5678	8.5726	+.0048	—.02%
70	7.8521	7.8610	+.0089	—.05%
60	7.1357	7.1372	+.0015	—.01%
50	6.4176	6.4142	—.0034	+.02%
40	5.6972	5.6842	—.0130	+.11%
30	4.9737	4.9544	—.0193	+.19%
20	4.2461	4.2265	—.0196	+.23%
10	3.5137	3.4990	—.0147	+.21%
0	2.7754	2.7754	—.0000	+.000%

cles, and may represent pounds, or inches or any units.)

The true dimensions for P. D and d. should be measured with considerable care. There are ways to compute any two of these when any one of them is given, which, however, are not appropriate for inclusion in this paper. The dimensions used in figure No. 4 are those for a conventional meter of the type under discussion.

The results of our findings with regard to these charts are shown in Table No. 1. It will be noted that, though the error is small, it is decidedly measurable, and the largest error of .0196 inches amounts to two-tenths of a differential inch on a 100-inch chart, or twice that amount on a 50-inch chart. Stated another way, the largest error is equal to three times the width of the lighter circular lines of the chart, or one and one-half times the width of the heavier circular lines. It therefore is readily visible and measurable.

It is interesting to note that the error (progressing from full-scale towards zero-scale) grows gradually from zero at full-scale to a sizable minus-error at three-quarters-scale; decreasing again to zero at half-scale; and that it then changes to an increasing plus-error, reaching maximum value at quarter-scale, and decreasing again to zero at zero-scale.

In any event the error is small, being much less than other errors always present in orifice meter calculations. There is satisfaction, however, in knowing exactly how small it is. Also there is interest in the fact that it exists at all.

Column No. 2 of Table No. 1 gives the correct diameters for 11 circles of the chart; that is, it gives 11 amounts whose magnitudes are so related to each other as to represent 10 equal displacements of the mercury surface, and therefore 10 equal divisions of the full-scale differential pressure.

This column would furnish a useful check on charts by actual measurement, if it is desired to check before putting them in service.

To adequately check a chart all that is required is a good draftsman's scale (preferably graduated in hundreths of an inch) and a magnifying glass. Diameters to the decimal places shown in Table No. 1 are readily and accurately obtained by measuring any circle in 10 or more different directions and striking an average.

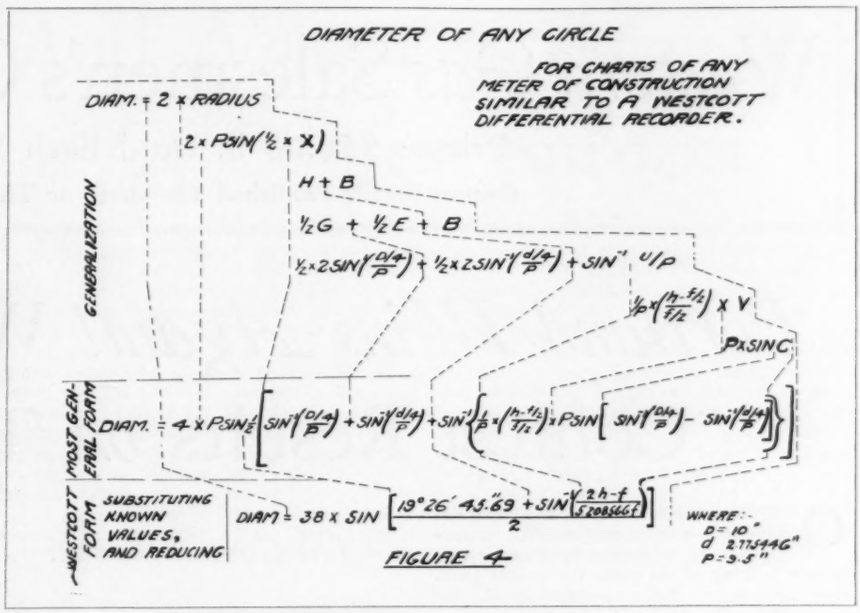


FIGURE 4

Fig. 4

WM. C. EDWARDS ACCEPTS UTILITY BUREAU POST

William C. Edwards, former publisher of the Atlanta Georgian, and prior to that publisher of the Washington Herald, has been appointed as director of the Texas Public Service Information Bureau, succeeding W. C. Grant, who has become associated with the Lone Star Gas Company.

Mr. Edwards is also a former publisher of the Record-Chronicle in Denton, Texas. While residing in Texas, he served as president of the Texas Press Association, president of the Texas Daily Press League, president of the Northwest Texas Press Association, member of the legislature, member of the Texas State Teachers' Association educational commission, and other important offices. In Atlanta he was vice-president of the Atlanta Writers Club.

Headquarters office for the Bureau is maintained in the Santa Fe Building, in Dallas.

PRODUCTION AND CHEMICAL CONFERENCE PLANS PROGRESS

Program plans for the third Joint Production and Chemical Conference of the Technical Section of the American Gas Association are well under way. The Conference will be held at the Lord Baltimore Hotel, Baltimore, Maryland, May 27, 28 and 29. Various committees of the Technical Section have named members to serve on a program committee for each group. The Carbonization, Chemical, and Water Gas Committees have each prepared a program particularly applicable to its own work.

6th Meter Course *at* Norman

THE Sixth Annual Gas Meter Short Course closed at Norman, Oklahoma, April 18, after a three-day session. Sponsored annually by the University of Oklahoma, the Corporation Commission of the State, and the Oklahoma Utilities Association, the Southwestern Gas Meter Short Course, is sustaining the interest of gas men throughout central, southern and middle-western states.

Professor W. H. Carson of the Oklahoma University engineering faculty, directed the school. F. D. Frank of the Cities Service Gas Company, Bartlesville, was chairman of the general committee for the 1929 course, and D. A. Sellers, of the Lone Star Gas Company of Dallas, Texas, has been named chairman for the 1930 sessions.

Attendance exceeded 450. Fourteen states were represented in the registration, these being in numerical order of representation: Oklahoma, Texas, Louisiana, Kansas, Pennsylvania, Missouri, Arkansas, Ohio, Colorado, Massachusetts, Illinois, Mississippi, Connecticut and New Mexico. Members of the engineering faculty of the University of Oklahoma and engineers, graduates of other technical colleges of established standing, conducted class work; while manufacturers' representatives, including several shop formen, supervised bench work. More than $25,000 worth of mechanical equipment was installed in the engineering building of the university by manufacturing companies for use in this course. The course covers not only domestic gas measurement but the measurement of natural gas in production, transportation and distribution involving maximum quantities and all pressures.

The three-day program opened with an address by President W. B. Bizzell of the University of Oklahoma, who welcomed the group for its sixth annual session. An outstanding feature of the course was the paper and discussion on "Early Developments of Orifice Meter Measurement" by Thomas R. Weymouth of Tulsa, president of the Oklahoma Natural Gas Corporation and also of the Oklahoma Utilities Association.

The annual banquet on April 17 was featured by a mechanical toastmaster and a complete absence of speeches. The toastmaster was a store-window figure, made up and manipulated by seniors of the engineering college. It stood up, sat down, flashed its eyes, turned its head and wagged its jaws, speaking, singing and smoking a real cigar as well as announcing the several entertainment numbers.

STANLEY GUTHRIE OF L. A. G & E. RESIGNS POSITION

Stanley W. Guthrie, assistant general counsel for the Los Angeles Gas and Electric Corporation of Los Angeles, California, resigned that position recently, after 16 years of service. Mr. Guthrie has entered private law practice in Los Angeles.

Western Gas Salesmen's Competition

Prizes: $50.00 in Gold Each Month

Contest Details Published Elsewhere on These Pages

Portland Wins Again! Water Heater Contest Results *on* This Page

OUR Water Heater Contest in the gas appliance salesmen's monthly competition being conducted by *Western Gas* is now a thing of the past. It's a safe guess that no one of the contestants—with the single exception of S. W. Davies, the first place man—will be really satisfied with the results. But here they are, as released by Clifford Johnstone, Executive Secretary of the Pacific Coast Gas Association, who is directing the judging on these salesmen's contests. Excerpts from Judge Johnstone's April 19 letter to *Western Gas*, announcing winners, and commenting upon the salient water heater merchandising arguments advanced by the contest participants, appear below.

Says Mr. Johnstone:

"THE selection of prize winners in the *Western Gas* Water Heater Contest has been most difficult because of a uniformity of expression and arguments among a number of the very excellent papers submitted. I have however, selected the following to receive the prizes which you offer:

First Prize—S. W. DAVIES
Salesman, Portland Gas and Coke Co.,
Portland, Ore.

Second Prize—LEONARD R. H. HARDIE,
Salesman, Southern Counties Gas Co.,
San Pedro, California

Third Prize—L. H. PAULL,
Saleslady, Spokane Gas & Fuel Co.,
Spokane, Wash.

Mr. Davies wins first prize because he is the only contestant who has taken into consideration that there are several types of gas hot water heating appliances, each of which is adapted to a particular purpose or need. He indicates that he explains these to the customers in an endeavor to give them the type of system which will serve them best. I think this is an excellent thought and shows that Mr. Davies is interested in securing the best possible service for his customers. In addition to this, Mr. Davies brings out briefly and well the outstanding arguments in favor of instant hot water,—cleanliness, health, convenience and dependability. I particularly like the way he enumerates the many uses for hot water in the home, one or two of which, at least, appeal to every prospect.

Second prize goes to Mr. Hardie largely because of his first sentence in which he brings out the point that the gas company is interested in the customer receiving service rather than in the mere selling of a water heater.

Third prize goes to L. H. Paull because of the excellence of her arguments. Hers is perhaps the best written paper of all, the only fault being a slight tendency to overstatements. L. H. Paull is a two-time winner in *Western Gas'* Salesman's Competition, having won the second prize in the gas range contest, and the Spokane Gas and Fuel Company is to be congratulated on having such excellent representation on its sales floor.

I feel that Justin M. Kennedy of the Southern Counties Gas Company, Santa Monica, Calif., should have honorable mention. He brings out one argument which would be effective with some women, that of the aid rendered by hot water in the preservation of beauty. Inasmuch as the customer to whom such argument could be presented must be selected with some judgment, I do not think it should be called one of the three most effective sales arguments for gas water heaters.

Yours very truly,
CLIFFORD JOHNSTONE,

The Contest Winner

S. W. DAVIES

who receives $25.00 first prize in salesmen's competition on gas water heaters, staged by WESTERN GAS.

Mr. Davies is one of the competent sales staff of the Portland Gas and Coke Company, Portland, Oregon.

This Month's Winning Manuscripts

SOMETHING in that bracing Portland ozone seems to produce a brand of super-salesmanship in gas company sales representatives of the section. At any rate, Portland has taken two contests in a row from a field of gas appliance salesmen drawn from most of the western States. Lewis H. Calhoun stepped out last month and claimed the $25.00 first money for our gas range competition. Now S. W. Davies, also of the Portland Gas and Coke Company, repeats the Portland victory.

Also worth special mention is the feat of L. H. Paull, saleslady for the Spokane gas & Fuel Company, who won the $15.00 second prize in the gas range contest, and now wins $10.00 as third in the water heater contest this month.

Salesmen entering the water heater contest, it will be remembered, were each asked to put forth what they considered their three most effective arguments used in the sale of this essential appliance. Here is the winner's selection of the arguments which sell water heaters for him in Portland, Oregon.

Below we publish the three winning contest replies, and one honorable mention—the entry of Justin McMurray Kennedy who was a near winner this month, as he was also in the gas range competition.

First Prize—S. W. Davies

Portland Gas and Coke Company,
Portland, Oregon

The Three Most Effective Sales Arguments I use in Selling Gas Water Heaters.

1. *CLEANLINESS:*

Mr. and Mrs. Prospect, your first thought for yourselves and family is health. Cleanliness is the prime factor of all things beautiful. Without cleanliness, wholesomeness is impossible. Hot water is the first necessity of cleanliness. What is more appreciated than real hot water—when you need it! This gas water heater will provide a paramount defender in your home—Hot Water. "It chases dirt." Cleanliness is the soul of culture.

2. *CONVENIENCE:*

Mr. and Mrs. Prospect, what greater pleasure can be afforded to your home than the convenience of a gas water heater? The advantages it offers are numerous. Think of the convenience of having sufficient hot water for baby's bath; for the husband's quick morning shave! washing of dishes; cleaning the floors; doing the laundry and a very important department in the home—speeding up your top cooking by starting off with hot water right from the hot water faucet. Your gas water heater is your faith-

Refrigeration Contest Closes on May 15

A FEW DAYS MORE—only a few—and it will be too late to send in that entry on *Western Gas'* refrigerator sales contest.

REMEMBER, May 15 is positively the closing date for entries to reach our publication offices! Salesmen in Middle Western and Southwestern states should air mail their entries to the *Western Gas* Contest Editor at 124 West Fourth Street, Los Angeles, upon reading this reminder.

ALL that is stipulated is that manuscripts be not more than 300 words long. Three hundred words in which to give your ideas on *how to sell domestic gas-fired refrigerators.*

$25.00—$15.00—$10.00—to the three best manuscripts!

And *Now*--Gas Furnaces *for* Contest Subject

OUR next contest theme in the *Western Gas* Salesmen's Competition—*gas furnace selling!* We've been saving this one for the summer months, and now is the time to get busy on that 300-word manuscript telling how to put these load builders on the gas company's lines. Read the full contest conditions which appear in the box below, and get those manuscripts to the contest Editor by June 15. Late entries are not eligible for the $50.00 prize money. Any gas appliance salesman may compete in this contest whether or not he specializes upon furnace selling.

For several good reasons we have selected gas furnaces as the next contest topic. Gas furnaces are year-round business to the salesman. To the gas company they represent a load builder which has no superior. And because their sale ties up so closely to building activity, which is at its height all over the country during the summer months now beginning, we feel that this time is a particularly appropriate one for gas salesmen to analyze their furnace sales technique. Results in this contest will be published in our July issue, when the summer is at its peak, and when furnace selling should be correspondingly prominent in every company's program.

Enough said. Put this down on your blotter. The *Western Gas* Furnace Salesmanship Contest is now open. Closing date—June 15.

ful servant to answer all these demands in your daily home life.

3. *SERVICE:*

Mr. and Mrs. Prospect—Think of the service a gas water heater provides in your home. There are three types (I explain each.) These appliances provide an absolute dependability and safety in operation; more sanitary and comfortable living conditions; fewer steps and more leisure for the housewife; low operating cost; greater durability in rendering you this hot water service. This ample hot water eliminates labor and worry, which in turn provides a pleasant, happy, modern home in which to live. A service that a gas water heater dominates.

Second—L. R. H. Hardie

Southern Counties Gas Company, San Pedro, California

The installation of this water-heater in your home, Mrs. Prospect, would be the highest service our company could offer you, because

I

It would ensure your having a continuous, 24-hour service of healthful, hot-water with no more effort on your part than the turn of a faucet when and where you please—no planning ahead, no unnecessary waiting to contend with, and, therefore, a considerable saving in valuable time as well as elimination of worry. "Service" is the thing nowadays, and we deem it a pleasure to provide you with a service at once so necessary and perfect.

II

And then, Mrs. Prospect, think how many precious minutes may be saved in the morning by the man of the house having his shaving-water on tap (a watched kettle, you know, never boils), and starting the day with a smile. The preparation of breakfast need now only be a matter of minutes, simply by using the faucet marked "hot" for cereals, eggs, etc. All the hundred-and-one odd cleaning and washing jobs that previously consumed so much time can be done better and quicker by the aid of a dependable hot-water service.

III

I think you'll agree that the secret of successful living is health—good health at that! And what makes for health, but a clean body, clean clothes, clean food, and clean home, to each and all of which a copious supply of clean, health-giving hot-water is essential. Children need never be "driven" to wash where there is hot-water on tap, and are the healthier for it. The whole family may well benefit by drinking a glass or two of ready-heated hot-water on rising, thanks to the hot-water service.

Third—L. H. Paull

Spokane Gas and Fuel Company, Spokane, Washington

1. The Automatic Gas Water Heater Means Greater *convenience and comfort.*

Think of it! All the hot water you need, day or night—just turn the faucet for a stream of piping hot water. Wash days and house cleaning days are greeted with a smile

(Continued on Page 105)

WESTERN GAS SALESMEN'S COMPETITION CONTEST CONDITIONS

Subject: SELLING DOMESTIC GAS FURNACES.

Each Contestant may have 300 words in which to give his ideas on how to sell domestic gas furnaces.

Who May Compete: Any regular reader of WESTERN GAS who is engaged in selling gas appliances to the public, either through gas utilities or dealers.

Prizes: For the manuscript incorporating the best sales ideas on domestic gas furnaces, $25.00 in gold. For the second best manuscript, $15.00 in gold. For the third best, $10.00 in gold.

Contestants will be limited to 300 words. No mention of manufacturers' products by trade name may be made, and contestants should refrain from comparing one manufacturer's product directly with another.

Manuscripts must reach publication offices of WESTERN GAS, not later than *June 15, 1929.* Address all communications to *Contest Editor,* WESTERN GAS, 124 West 4th Street, Los Angeles, Calif.

Name, address, company affiliation and position of contestant must appear on each page of manuscript. Double-spaced, typewritten replies, printed on one side of sheet only, are preferred. Manuscripts become property of WESTERN GAS, to be published or withheld as desired, and no responsibility for their return is assumed.

Winning replies will be published in the July issue of WESTERN GAS and prize money paid to winners at that time.

Judging of replies will be conducted by Clifford Johnstone, Executive Secretary of the Pacific Coast Gas Association, assisted by a committee.

Monthly Contests: **In the June issue of *WESTERN GAS* another Salesmen's Competition, open to readers of *WESTERN GAS* (Prizes, $50.00 in gold) will be announced, the winning replies to be published in the issue of August, 1929.**

Today's Natural Gas Revolution

The Texas-Denver line was begun in December of 1927 and completed about six months later. The 22-inch line, which was 340 miles in length, was constructed under the direction of Ford, Bacon & Davis Company, Engineers. Interests back of the line were the Standard Oil Company of New Jersey, the Prairie Oil & Gas Company, the Cities Service Company, and its subsidiary, the Public Service Company of Colorado. Effective load-building efforts in territory served by this line form an interesting feature in this number.

Another line constructed by Ford Bacon & Davis was the 212-mile, 18-inch gas line originating in the Monroe fields of Louisiana, and now supplying natural gas to Memphis, Tennessee. Construction began on this line on September 9 and was completed December 6, which is recognized by pipeline engineers as being something of an accomplishment.

The Memphis Power & Light Company is distributing the gas in Memphis. Gas is also delivered to the Arkansas Power & Light Company in Arkansas for distribution in a few towns in the souhteastern part of the State, and to the Mississippi Power & Light Company for distribution in that State. This line was constructed for the Memphis Natural Gas Company.

LARGEST OKLAHOMA PROJECT

The Consolidated Gas Utilities Company of Oklahoma City, Oklahoma, has fathered the largest gas construction project in Oklahoma during the past year, having begun and completed within the year a 14-inch line from the Wheeler County (Texas) gas fields to Enid, Oklahoma, a distance of 165 miles. In his article published in this month's *Western Gas* on Oklahoma natural gas progress, O. D. Hall gives further details on this line. More than 100 miles of main line extensions to this Consolidated Gas Utilities carrier have also been constructed, brnging the total of gas transmission lines operated by the company to 1,000. Gas was turned into the Texas-Enid line on November 1.

At its organization in July, the Consolidated Gas Utilities Company acquired all properties of the former Midwest Gas Company, Blackwell Pipe Line Company, Oklahoma Northern Utilities Company and the Larutan Gas Corporation. It now supplies gas at wholesale to 25 cities and serves at retail 24 cities in western and northern Oklahoma and south central and south eastern Kansas. Apache, Oklahoma, was added during recent months to those receiving gas at the city gate, and Weatherford, Custer City, Thomas, Fay, Watonga, Hitchcock, Southard, Canton, Okeene and Fairview were added to those receiving the complete distribution service. Among the larger towns receiving gas at wholesale are Comanche, Elk City, Enid and Lawton in Oklahoma; and Wichita, Hutchison, Neodesha and Altoona in Kansas. Fort Sill, Sayre, Cushing, Custer City, Tonkawa, and Blackwell in Oklahoma; and Sterling and Lyons in Kansas are among those receiving gas at retail.

(*Continued from Page 54*)

The domestic and industrial consumers served number 35,000. Oil refineries, cement plants, salt works, gypsum mills, cotton gins, power plants and brick plants use the gas industrially.

ENHANCE LITTLE ROCK SUPPLY

Perhaps the most important expansion project undertaken by the Arkansas Natural Gas Corporation, of Shreveport, Louisiana, following its organization in April, 1928, was the construction of 96 miles of 10-inch welded gas line from Clarksville, in Johnson County, Arkansas, to North Little Rock. Construction on this line was begun in October and was just recently completed. This project was a part of the program to increase the supply of gas in Little Rock. Enroute the line supplies gas to several towns through its subsidiary, the Public Utilities Corporation of Askansas.

The Arkansas Natural Gas Corporation came into existence through the merging of several companies, chief of which were the Arkansas Natural Gas Company, and the Natural Gas & Fuel Corporation and their subsidiaries, the Arkansas Fuel Oil Company and the Public Utilities Corporation of Arkansas. Bethany Oil & Gas Company (now known as the Arkansas-Louisiana Pipeline Company), the Reserve Natural Gas Company and the gas properties formerly owned by the Southwestern Gas & Electric Company, now operated under the name of the Southern Cities Distributing Company, were also included in the merger, which brought these properties under the control and management of Henry L. Doherty & Company.

Other additions and extensions to the Arkansas system since its organization include 57.5 miles of 12-inch combination welded and coupled line from Emmett, Arkansas, to El Dorado; connecting the Champagnolle field by seven miles of 10-inch gathering lines and 10-inch pipeline from Richland Parish, Louisiana, field into the main line system at Trees Compressor Station at Emmett; eight miles of 8-inch screw line from a point on the 10-inch Little Rock-Clarksville line, to Pulaski Heights in Little Rock; 16 miles of 10-inch welded line from Garland City on the Caddo-Little Rock Trunk line, to Texarkana; 14 miles of 6- and 4-inch screw line from Waldo to Stephens, Arkansas. Other extensions and replacements bring the total mileage to 228.7. The company is now taking gas out of every producing area between Shreveport on the south, Richland field on the east, Clarksville on the north and Bethany, Louisiana, on the west. In Arkansas, Louisiana and Texas, it owns 70 gas wells with an open flow of approximately 500,000,000 cubic feet per day. In addition gas is bought from 38 wells owned by other companies.

Approximately 70,000 customers in 50 towns in North Louisiana, East Texas and Arkansas are served by this company through a system of gas main aggregating practically 1,750 miles, including main line, field gathering and distribution line. Among the cities served are Shreveport, Texarkana, Hot Springs, Little Rock, Pine Bluff, Clarksville and El Dorado.

The most recent acquisition to the system came through the recent purchase of the Little Rock Gas & Fuel Company's distribution system in Little Rock and North Little Rock. This property, which serves a combined population of 123,000, was purchased from the Dawes Brothers of Chicago. Arkansas Natural has been furnishing the Little Rock Company with gas at wholesale.

Nine main line and field compressor stations consisting of 15,465 horsepower are operated. The company also owns four gasoline plants with a daily production of about 23,000 gallons.

MAGNOLIA PROGRAM EXTENSIVE

At another point in this issue will be found Charles A. Breitung's review of outstanding gas developments in Louisiana. One of the larger projects in this State last year was the extension by the Magnolia Gas Company of its line from the Sarepta Station in the Cotton Valley field in North Louisiana, 105 miles to Alto in the Richland Parish field, thereby practically doubling the available gas supply for the Magnolia system.

Construction work was begun in May and was completed in October. Electric welded pipe, made of 60,000-pound tensile strength steel, equipped with bell and spigot and flexible expansion joints was used on the line, which is 16, 18 and 20 inches in diameter. At the same time that this extension was being constructed, a line was also laid from Sarepta Station to Latex, a distance of 55 miles, which looped a line already existing between these two points.

The original line of the Magnolia was constructed in 1924 from Sarepta to Port Arthur, a distance of 225 miles. In 1927 the Company's line from Latex to Dallas and Fort Worth was constructed. The Magnolia functions chiefly as a distributor of gas for industrial purposes, some of the largest gas users within the State of Texas being on its lines. The parent company is the Magnolia Petroleum Company.

CITIES SERVICE PROGRAM

Although the transmission development of the Cities Service Company during the past year does not quite measure up in extent to the year 1927, when this company completed its 250-mile, 20-inch line from the Amarillo, Texas, fields to Wichita, Kansas, yet the expansion program of this utility has been great, probably leading that of any other company in the Southwest.

In December of 1927 the company completed its line from Amarillo to Wichita. In 1928 a 16-inch line was constructed from Wichita to Ottawa, a distance of 132 miles, as an extension to the line from the Panhandle. At Ottawa the company previously had two 16-inch lines extending to Kansas City. Another 16-inch line was constructed from Ottawa to Kansas City, a distance of 38.5 miles, during 1928, bringing the total

distance covered by the Amarillo-Kansas City line to 420 miles. Also in 1928 the company began construction of a line from Ft. Leavenworth, Kansas, to St. Joseph, Missouri, where the Doherty interests had purchased the city distributing unit, the St. Joseph Gas Company. Natural Gas was turned into the St. Joseph mains on January 15, 1929.

Other extensions in 1928 included a seven-mile branch from the Amarillo-Kansas City line to Emporia, Kansas, which is now burning natural gas. In Kansas City, approximately one million dollars was put into main line improvements during 1928 by the Kansas City Gas Company. One of the most important units in this development was the building of a line to North Kansas City, Missouri. Another was the construction of a 24-inch line to Sugar Creek, Missouri, to serve the Standard Oil refineries at that place.

Already this year work has been started on a line extending from a point near Joplin, Missouri, to Springfield, Missouri. In addition to serving Springfield the line will serve Neosho, Pierce City, Marionville, Monett, Billings, Forest Park and Republic, enroute.

In March of this year the Gas Service Company announced the purchase of the Jackson County Light, Heat and Power Company, at Independence, Missouri. An extension will be laid from the Sugar Creek line to serve approximately 5,000 customers in this city.

The Montana-Dakota Power Company, a subsidiary of the Minnesota Northern Power Company, has to its credit an extensive 1928 development in Montana and the Dakotas. A line 175 miles in length was built from the Baker-Glendive structure to towns in the Black Hills of South Dakota, serving Belle Fourche, Sturgis, Spearfish, Lead, Deadwood, Whitewood, Piedmont, Blackhawk, Tilford and Rapid City. A population of over 50,000 is served from the 440 miles of distribution lines on this main gas pipeline.

Franchises are being sought by the Montana-Dakota Power Company and the Black Hills Utilities Company, both subsidiaries of the Minnesota Northern Power Company, in Bismark and Jamestown, North Dakota, and the Montana-Dakota has bought the gas distribution companies in Mandan, Bismark and Valley City, all in North Dakota. This project, if completed, will cost approximately $4,000,000. Possibility is seen that it will prove a link in the major system between the Montana gas fields and cities in Minnesota, persistent rumors of which seem to gain momentum as the months pass by.

Franchises have been granted this company in Glasgow, Valley County, and Chester, in Liberty County. Manufactured gas plants in Chinook and Havre have been bought by the Montana-Dakota Power Company, giving credence to the belief that future plans contemplate a line northern Montana which would eventually connect with the Kevin-Sunburst and Sweetgrass Hills fields.

The line from the Kevin-Sunburst fields in Toole County to Great Falls, about 100 miles south, was constructed about a year ago, during the early months of 1928 by the Montana Cities Gas Company. This line serves Shelby, as well as several smaller towns enroute, and was one of the first of Montana's major natural gas developments. Great Falls has an estimated peak load of 15,000,000 cubic feet daily.

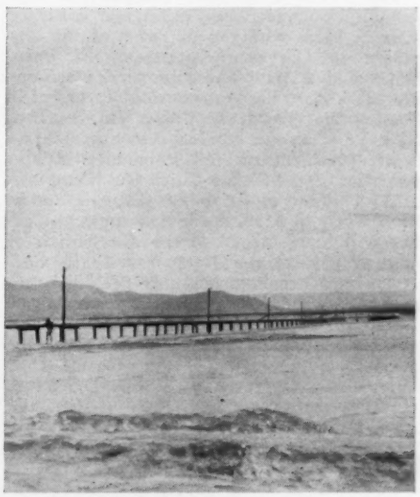
Another project which has been discussed for some time, is the construction of a line from Great Falls to Butte, Helena, and Anaconda. If this line is built, these cities will undoubtedly be supplied with gas from the Shelby district, from whence comes the supply for the city of Great Falls.

The existence of large proven gas areas on the Canadian side of the International Boundary in the Sweetgrass Hills district of Alberta is a further stabilizing factor in the natural gas outlook for the cities of Montana and gas lines originating in that State.

LONE STAR ADDS 56 TOWNS

Probably the oldest operating company in the Southwest is the Lone Star Gas Company of Dallas. In 1909 the company was incorporated for the purpose of producing and transporting natural gas, and its first gas line undertaking was the construction of a 16-inch line from Petrolia field in the northern part of Clay County, Texas, to Fort Worth, a distance of approximately 90 miles. From this beginning has developed a company operating more than 3200 miles of gas system serving more than 200,000 consumers in 230 towns.

In 1927 some 909 miles of gas line were added to the Lone Star system and 65 new towns joined those receiving gas. During the past year 456.29 miles of gas line were added and 56 new towns became users of Lone Star gas.



On the El Paso natural gas line this trestle has been constructed, a mile in length, across a salt marsh

During the coming year 198½ miles of system will be constructed. A 20-inch pipeline recently announced for immediate construction from Petrolia, Texas, to Fort Worth and Dallas, a distance of 135 miles, will be the chief development in this expansion program. The construction of this line will give the company four trunk lines into Fort Worth and Dallas from fields of Oklahoma and Texas, and will supplement the supply of gas to a number of other towns in this section.

Twenty-one compressor stations with a combined capacity of more than 33,000 horsepower are maintained by the company, which secures its gas from 21 fields having a total open flow capacity of more than a billion cubic feet of gas per day.

Most of the gas reaches the consumer through the Community Natural Gas Company, the Municipal Gas Company, the Dallas Gas Company and the Fort Worth Gas Company, subsidiaries of the Lone Star. Approximately 1,500 industries are served with gas.

At another place in this article mention is made of Moody-Seagraves' connection with the Louisiana-St. Louis gas line. These interests, operating as the United Gas Company, maintain one of the leading gas systems in the Southwest. A total of 2,659 miles of gas system is controlled through subsidiary companies. More than 1,300 miles of this is transmission system, 1,210 being distribution line, and the remainder gathering line.

Chief subsidiary companies are the Houston Gulf Gas Company, Houston Gas & Fuel Company, Dixie Gulf Gas Company and the Southern Gas Company. The Houston Gulf Gas Company and its subsidiary operate 357 miles of main line from the Refugio and White Point fields to Houston, where they supply gas to the Houston Gas & Fuel, the distributing company. This line also serves the Southwest Gas Company, Houston Lighting and Power Company, Texas Portland Cement Company and other industries.

The Dixie Gulf Gas Company main line extends from the fields in Southern Louisiana to Beaumont, Palestine, Port Arthur, Orange and other cities. Approximately 336 miles are embraced in this system and that of its subsidiaries.

The Southern Gas Company and its subsidiaries operate 433 miles of main pipeline and gathering line, extending from the Cole field, Carolina-Texas fields and others to Laredo, San Antonio and Austin.

Twenty-six new towns were added to their system in 1928 and 71 miles of gas line laid. Among the towns added were Beaumont, Laredo, Marshall, Port Arthur, Nacogdoches and Jacksonville. In 1929 a line from near Refugio will be constructed to Converse, near San Antonio, a distance of 106 miles. Construction work is expected to begin at once on this line, which will serve enroute, through a newly organized subsidiary, the Southwest Distributing Company, the towns of Karnes City, Kennedy, Floresville, Poth, Falls City, Sashamco and Elmendorf. A lateral line connecting with the main pipeline at Karnes City will supply Runge, Nordheim and Yorktown, east of that point.

The Moody-Seagraves interests are also contemplating a line from Laredo to Monterrey, Mexico.

Another company very active in the Houston territory is the Houston Pipe Line company and its companion organization, the Huston Natural Gas Company, through which it distributes gas in towns and cities. The pipeline company operates 650 miles of main line which does not include the distribution plants and field lines. It serves gas to 48 towns, 14 of which have been added to the system within the past year. Thirty-five miles of 12-inch and 50 miles of four- and six-inch line were constructed last year, the first being an extension from Houston to La Porte. Further extensions from the main lines to small towns made up the remainder of the construction program.

The main line of the company begins at Bruni field in Duval County, Texas, and extends in a north and easterly direction to Baytown, approximately 296 miles away. At a point about 12 miles south of Houston, a loop line extends to and around Houston, joining the main line at South Houston, about 18 miles distance from Baytown, the terminus of the line. Three hundred and fifty industries are served as well as 11,000 domestic customers. The company supplies gas to producers and manufacturers of electricity, sulphur, sugar, creosoted lumber, tin cans, cement, refined oil products, chemicals, ice, tools and oil well supplies, fire works,

salt and many others. Some of the principal towns served are Houston, Victoria, Beeville, Galveston, Palacios, Bay City, Sugarland, Texas City and Alvin.

A few other companies centering their activity in Texas are the Stamford & Western Gas Company, the Rio Grande Valley Gas Company, Northwest Texas Gas Company, Inc., Southern Union Gas Company, Texas Cities Gas Company, Cimarron Utilities Company, Texas-Louisiana Power Company, West Texas Gas Company and Tri-Tex Utilities Company.

STAMFORD & WESTERN COMPANY

All of the transmission system of the Stamford & Western Gas Company, of Stamford, Texas, was constructed during 1928. The main line of the company begins at Chillicothe in Wheeler County, running almost due south to Stamford, Texas, and then westward to Rotan. Twenty-three towns, among them Seymoure, Munday, Haskell, Stamford, Anson, Hamlin and Rotan, are supplied with gas.

Thirty-four hundred domestic customers, together with 60 industrial customers, make the load element for this system, which aggregates 200 miles of six- and eight-inch line.

The company plans to construct 165 miles of transmission system in Arkansas during the coming year, having organized a separate corporation to install new gas systems in a group of towns in northwest Arkansas. The gas line to be constructed will originate in the gas fields near Fort Smith, Arkansas, and will extend northward, where it is proposed to serve Fayetteville, Springdale, Siloam Springs, Rogers and Bentonville. It is understood that gas franchises have already been secured in some of these towns.

RIO GRANDE VALLEY GAS COMPANY

The Rio Grande Valley Gas Company operates 341 miles of gas system, 286 of which were constructed during 1927, the year that the company began to operate. The main line of the company starts in the Miranda City or Laredo gas field and runs southeast to Brownsville, supplying a total of 13 towns. These include Brownsville, San Benito, Harlingen, La Feria, Mercedes, Weslaco, Donna, Alamo, San Juan, Pharr, Edinburg, McAllen Mission. The headquarters of the company are at McAllen. Types of industries served are power plants, clay products companies, laundries, bakeries, canning companies, hospitals, hotels and restaurants. The domestic customers number 5,643.

NORTHWEST TEXAS OPERATOR

A northern Texas gas company which is an out-crop of the year 1928 is the Northwest Texas Gas Company of Vernon, Texas, successors to the Pease Valley Gas Company. The 122 miles of main line owned by the company were constructed during 1928. An additional 76 miles makes up the extension program for 1929. The line being planned will begin at the gas field at East Prairie in Coal County, Oklahoma, and end at Atoka and Coalgate, Okla.

The present system of the company taps the Stamford and Western and Northern Texas Utilities transmission line, from the Shamrock Hills, serving 13 cities. Among these are Odell, Medicine Mound, Rayland, McCauley, Sylvester and Leuders. The number of domestic customers served is 265, which does not include those in seven towns now being connected to the system.

The Murchison Oil Company of Dallas is the parent company of the Southern Union Gas Company of Texas and the transmission company, the M & M Pipeline Company.

These subsidiary companies were organized about 18 months ago. Most of their system has been constructed within the past year. A 65-mile line originating in the Winkler County, Texas, field, serving Wink, Pyote, Wickett, Monahans, Barstow, Pecos and Cheyenne in West Texas, is the largest unit in the system. Part of this line has just been completed. The company also owns a 30-mile gas line in Oklahoma, originating in the Roxana-Logan County field and serving Kingfisher, Dover and Hennessey.

In East Texas, the company has 55 miles of main line serving Brenham, Hempstead, Prairie View and Waller. The line originates in the Humble-Raccoon Bend field and is just now being completed. It is to be extended to serve Belleville.

Distribution systems in all of the towns with the exception of Brenham are owned through the subsidiary company, the Southern Union Gas Company. Gas is sold at Brenham, Texas, to the Texas Cities Gas Company, distributors.

The Texas Cities Gas Company, a distributing company only, came into existence June 1, 1928, with the purchase of the city plants at Galveston, Brenham, El Paso, Waco and Paris. These properties are operated under the supervision of Electric Bond & Share, with the Union Utilities, Inc., New York, as the holding company. H. G. Scott, president of this company, is also president of the Texas Cities Gas Company.

With the completion of the line to El Paso, early in May, the last of these properties will have turned to the distribution of natural gas. Natural gas service in Galveston and Brenham has only preceded that at El Paso by a very short time, however. Galveston began to change over to natural gas on March 28. The gas is being supplied from the mains of the Houston Pipe Line Company through a line extending 11 miles across the bay, tapping the Pipe Line Company's main at the Texas City Sugar Refinery. The 11-mile line is owned by the Texas Cities Gas Company.

Brenham is being supplied with natural gas from the line recently completed by the M & M Pipe Line Company of Dallas into Brenham from the Raccoon Bend gas field. Waco and Paris are supplied from the mains of the Lone Star Gas Company.

The Texas Cities Gas Co. serves approximately 37,000 customers over the five properties.

Announcement was made in March of the consolidation of the Texas County Gas Company with the Cimarron Utilities Company now operating under the name of the latter company. The Texas County company owned transmission lines in Texas County and also gas distribution systems in Goodwell, Guymon, Hooker, Texhoma, and Tyrone. The Cimarron Utilities Company owned electric, water and ice systems in Texhoma and Boise city.

A gas company operating out of Fort Worth is the Texas-New Mexico Power Company and the Texas-Louisiana Power Company. About a year ago this company purchased the properties of the Texas Gulf Power Company. The towns which it serves are Breckenridge, Ranger, Nocona, Graham, Woodson, Graham Field, Eliasville, Gainesville and Kermit. The last three named were added to the system in 1928. Approximately 9,000 domestic consumers are served, with about 175 industrial consumers. The company owns 300 miles of gas system, 14 of which were added to the lines last year.

WEST TEXAS GAS COMPANY

Another company supplying gas from the Amarillo fields is the West Texas Gas Company, a subsidiary of the Prairie Oil & Gas Company, with headquarters in Amarillo. The company constructed 236 miles of line in 1927 and added to that about 110 miles of line during the past year. The original line from the Amarillo fields, which terminated at Slaton, Texas, has been extended to serve the towns of Tahoka, Odonnell, Lamesa, Stanton and Midland.

A line talked of for South Texas is one for which a survey has been conducted by the Tri-Tex Utilities Company, extending over five counties, including Maverick, Zavala, Dimmit, LaSalle and Frio. The Tri-Tex already has a line extending from the gas field in the northern part of Zavala County to Uvalde City. The line contemplated would run south from the gas field through Zavala and Dimmit Counties, east to La Salle County and north to Frio County, towns to be supplied with gas being Eagle Pass, Batesville, La Prior, Crystal City, Carrizo Springs, Asherton, Catarina, Cotula, Dilly, Derby and Pearsall. The main line would be 160 miles in length.

BELCHIC & LASKEY, INC.

Belchic & Laskey, Inc., of Shreveport, Louisiana have during the past year purchased the gas system of the Southwest Gas Company, formerly of Houston, Texas. The Houston company operated more than 158 miles of system, supplying approximately 5,000 customers. Among the towns now served by the Belchic & Laskey interests are Cuero, Yoakum, Gonzales, Luling, Lockhart, Cross Plains, and Stephenville. The gas for these towns is obtained from the Houston Gulf Gas Company line from the Refugio fields, which it taps at Edna. In Oklahoma the company supplies gas to Ada, Seminole, Maude, Cromwell, Earlsboro and Sasakwa.

Belchic & Laskey, Inc., also operate the Northwest Louisiana Gas Company and the Peoples Gas & Fuel Company of Shreveport, La. Of the two, the latter is the distributing company owning all of the town plants and

franchises. One hundred eighty miles of line are operated and 12 towns served. The source of the gas supply is the Sarepta Gas field and the Monroe Gas field.

A year ago plans were launched by Belchic & Laskey to project a gas system from the Richland Parish gas field to cities and towns in South and Central Louisiana, to serve the region known as the Acadian country. The main line was to have totaled 375 miles, approximately. While no definite announcements have been made within the last few months regarding this project, it is understood that life still abides in the proposition.

A gas development during the past year of unusual interest to the industry was the changing over of New Orleans to natural gas, on September 1. The gas is brought to the city by the Southern Gas & Fuel Company, which secures its supply from the mains of the Interstate Natural Gas Company, Inc., at Destrahan, a short distance out of New Orleans.

The Interstate line, originating in the Monroe fields, was completed to Baton Rouge, a distance of 170 miles, in January, 1927, for the purpose of supplying industrial gas to that locality. Later this 22-inch line was extended to Destrahan. New Orleans Public Service, Inc., distributes the gas in the city of New Orleans.

It is understood that within the next year the Interstate line may be looped the entire distance from the Monroe fields so as to provide a more adequate supply for the market in and around New Orleans. Recently, loop lines, aggregating 25 miles have been completed at two points, and will be used to provide additional storage for gas for peak load demands.

The Moran Corporation of Shreveport, Louisiana, has recently completed the construction of a six-inch line from the White Point gas field in San Patricio County, Texas, to Arkansas Pass. At Ingleside, through which the line passes, a considerable amount of gas is supplied to the Humble Oil & Refinery. Gas for domestic purposes is also delivered at Portland, Gregory, Ingleside, and Aransas Pass. This is regarded as but a forerunner of other development to take place in this section.

Another Louisiana operator is the Southern Gas Line, Inc., of Monroe, La., a subsidiary of the Columbian Carbon Company, and maintaining approximately 132 miles of gas system. Of this, 22 miles were constructed during the past year. The main line of the company is 107 miles in length, extending from Fairbanks to Alexandria. The 22-mile line extends from Tullos to Winnefield. The company sells gas at wholesale only, one of the distributors being the Pineville Gas Company, another subsidiary of the Columbian Carbon Company. Principal towns served are Monroe, Alexandria, Pineville, Columbia, Winnefield and Standard, the last two of which were added to the system during the past year. The company is planning additions to its system during the coming year. It now serves about 100 industries, chief among which are municipal power plants, brick plants, packing houses, ice plants and cotton seed oil mills. Domestic users of the gas number more than 12,000.

A. H. Culbertson of Fort Worth, Texas, is understood to have recently begun the construction of a gas pipeline from the gas field 22 miles south of Madill, Oklahoma, to that city, and to be planning to extend the line also to Kingston, where the Culbertson interests have a gas franchise.

The Central States Power & Light Corporation has also completed, at a cost of $125,000, a gas transmission line between Elk City, Oklahoma and Carter. The line is 6⅝ inches in diameter and taps the Sayre, Oklahoma, gas fields.

Welding the Pacific Gas and Electric Line at Tres Pinos, California

Oklahoma Natural Gas Corporation of Tulsa, Oklahoma, while operating gas systems in both Texas and Kansas, has most of its properties centralized in Oklahoma. This company is one of the leading operators in the Southwest, serving gas to more than 113,000 domestic and industrial consumers in 61 communities and maintaining approximately 3,500 miles of gas system.

On March 1, 1928, the company took over the gas properties of the Oklahoma Gas & Electric Company in Oklahoma, which included the distribution systems in 14 cities and towns. The company now serves the interlying territory within that State, bounded by Grady County on the southwest and Osage, Rogers, Wagoner, and Muskogee Counties on the north and east. A separate system serves Ardmore, Oklahoma, and nearby towns. Separate systems are also operated in the San Angelo, Texas, territory and in Southern Kansas. Gas is secured from more than 30 different gas fields.

The Texas system embraces what was formerly known as the Western Gas Service Company's system. Five towns in that section are served—Miles, Rowena, Ballinger, Coleman and San Angelo. Some of the other cities and towns served are Oklahoma City, Tulsa, Muskogee, Enid, Chandler, El Reno, Norman and Ardmore, Oklahoma; and Iola and Chanute in Kansas.

A company particularly active in Central Kansas is the Western Gas Company of Salina, Kansas. This company started operation as distributors of natural gas in January of this year and has already obtained franchises and commenced construction of city plants in 11 towns in central Kansas. They include Ellinwood, Great Bend, Hoisington, Otis, Olmitz, Bison, La Crosse, Victoria, Walker, Gorham and Larned. The number of meters estimated in these towns is 5,100. Gas franchises have also been granted the company in Garfield, Kinsley, Spearville, Ford, Bucklin and Mullinville, and construction work will begin in these towns later in the year.

A companion organization, the Western Pipe Line and Gas Company, has already constructed a line from the field near Bison, Kansas, north to Victoria, a distance of 28 miles, and east 10 miles to Gorham. It has also constructed a line from Bison, connecting the towns of Otis, Olmitz, Hoisington and Great Bend, which is being extended to Ellinwood. Another line has been started from the Bison fields to Larned, Kansas, which will bring the total mileage of main line to 90 miles.

NEW MISSOURI-KANSAS COMPANY

A gas transportation company coming into prominence in the Kansas and Missouri territory is the Missouri-Kansas Pipe Line Company, organized in May, 1928, under the corporation laws of Delaware, with headquarters at Kansas City. The company is centering its activity in the shale gas fields of eastern Kansas and western Missouri, in which districts it is reported that more than 500 producing gas wells have been brought in since March of 1928.

The company acquired the pipeline system and compressor stations owned by the Shippey, Maddin and Parish Gas Company, located in Miami County, Kansas, and Cass County, Missouri, and also in December of last year purchased the Fuel Gas Company of Greeley, Kansas. By the first transaction 113 miles of line were secured, and by the second, 50 miles. Over 300 miles of pipeline are now owned by the company, and approximately 100 miles of main line in Kentucky County, Kansas, will be added this year, in addition to expansion in Miami and Anderson Counties of the same State.

Four compressor stations were built by the Missouri-Kansas Pipe Line Company last year, at Stilwell, Paola, Rantoul, Kansas, and one in the suburbs of Kansas City.

The company now supplies gas for Belton, Grandview and Martin City, Missouri; Paola, Osawatomie, Ottawa, Louisburg, Bucyrus and Somerset, Kansas. In addition it has a surplus gas contract with the American Pipe Line Company allowing it delivery of up to 12,000,000 cubic feet of gas per day at Kansas City, Missouri. In the near future gas will be supplied to Independence, Missouri, a city of approximately 18,000 population that is being served with manufactured gas at the present time.

Gas resources in New Mexico are prompting other gas expansion in addition to that

of the El Paso project. One of the active companies in this section is the Pecos Valley Gas Company of Artesia, New Mexico.

Its operations center in the Artesia fields, from which it has extended lines as far north as Roswell and south to Carlsbad. Enroute to Roswell, the 45-mile line serves Lake Arthur, Hagerman, Greenfield and Dexter. At Roswell the gas is delivered to the Southwestern Public Service Company, which holds the natural gas franchise. The Roswell line is 6⅝ inches in diameter.

While the foregoing review does not represent all of the natural gas activity of the past year, nor cover all of the developments projected for 1929, it is believed that it is comprehensive of most of the significant projects. Certainly it presents incontenstable evidence that we are witnessing an amazing expansion in our Western natural gas industry, an expansion which has quickened its pace in the beginning months of 1929, and one the ultimate limits of which no one can foretell.

Constructing *the* El Paso Line

(*Continued from Page 66*)

of water and great distances from any place of supply, gave the contractors many difficult problems to solve.

The length of the main line, including the line through the city to the industries on the other side, is approximately 218 miles.

Pipe throughout is 16 inches in diameter, manufactured by A. O. Smith Corporation. It is longitudinally welded and has ¼ inch walls; 30 foot lengths, 16 inch OD, are used. The pipe weighs 42.053 pounds per foot, and has a guaranteed tensile strength of 60,000 lbs. It is also guaranteed to have a working pressure of 450 pounds with a factor of safety of four; upon completion of the line it will be tested to at least 500 pounds of pressure. A. O. Smith Corporation accordian type expansion joints are used every seventh joint through level country and are placed at more frequent intervals as needed.

The pipe is given two heavy coats of paint where the soil is non-corrosive; and through corrosive soil, one coat of asphalt is applied hot and wrapped with asbestos felt and tied with copper wire.

The line is electrically welded, using field generators, made by the General Electric Company and the Lincoln Welding Corporation. Sixty-four electric welding machines are used, and in addition some acetylene welds are made.

Ditching machines are used except where hand ditching is necessary in the solid rock, where pneumatic drills are used.

Pipe is handled and lowered by tractors, equipped with Wilson, McManus and Cohen winches and booms. The pipe is lowered from three points of suspension, to avoid undue strains.

In welding the joints are made up using "Weldit" Yellow Jacket 5/32-inch rod, having string bead, and finished with Weldit No. 18 rod, 3/16-inch diameter, using 4 pounds of rod per joint. The amperage used is 140 to 185 amperes at generators.

It is found that the personnel of the welding crew is by far the most important factor in having the welding done properly. About nine joints per welder per 10-hour day is the approximate average of what can be done under favorable welding conditions. High sandstorms are frequent, during which it is necessary to protect the welders from the blown sand by shields, which completely house the operations. To check the work of the welders, the inspectors cut frequent coupons from the welds with John T. Burr & Sons milling machines, especially designed for the purpose.

At the Guadulupe Mountain crossing, the line passes over a rimrock about 500 feet above the valley, which elevation it attains at a 40° slope. The pipe here is anchored at frequent intervals by concrete piers, set into the solid rock, with expansion joints used between every pier.

The Pecos River is spanned by a 12-ton highway bridge and the line is manifolded in two 12-inch pipes, welded solid over the bridge section with long-sleeved Dresser couplings at each end. Westcott 16-inch gate valves with a working pressure of 650 pounds are placed at frequent intervals along the line, and 6-inch blow-offs are installed on each side of the gate valves. Sixteen-inch ladder drips are installed at depressions along the line to catch condensations. One-inch syphons are installed approximately every five miles. Orifice meter stations are placed at the gathering and distributing ends and mid-way along the line.

All under crossings of canals, railroads, and highways are cased with steel casing with vent holes at each end.

A telephone line of complete metallic circuit follows the line, with telephone booths placed at frequent intervals. The line is connected with the Bell Telephone System at El Paso.

A road is being constructed along the entire length of the line.

Where the line crosses the salt marshes, west of the Guadulupe Mountains, it rests on piling exposed to the air. Long sleeve Dresser Couplings are placed every four joints along this part, the rest of the line being welded solid.

On account of the high pressure at the wells, it will not be necessary to install compressor stations for several years, unless the market in El Paso expands greatly beyond present expectations. It is evident that for a long period of time, El Paso will have all of the advantages that follow from a large supply of natural gas.

The El Paso Natural Gas Company is under the direction of Paul Kayser of Houston, who is president; H. G. Frost of El Paso, vice-president and general manager; Sam H. Benbow of Houston, secretary-treasurer; and A. L. Forbes, Jr., of El Paso, general superintendent. Its board of directors is composed of: Messrs. Paul Kayser, H. G. Frost, J. W. Colvin and A. C. Howard all of Houston; and Messrs. W. J. K. Vanston, C. M. Weld and R. S. Jarvis, all of New York.

White, Weld and Company, New York, financed the company. C. Minot Weld of Weld & Liddell, New York, reported on the project for the bankers; A. Faison Dixon of Brokaw, Dixon, Garner & McKee, New York, reported on the gas supply.

Smith Brothers, Inc., of Dallas, Texas, are constructing the line under a turn-key contract, with F. G. Hoffman and P. B. Keller in charge of construction. The inspectors and engineers are Brokaw, Dixon, Garner & McKee, New York, with John R. Chamberlin as chief inspector and 14 assistant inspectors.

TEXAS CITIES GAS CO. HAS TWO NEW OFFICERS

C. K. Patton, for a number of years commercial manager of the Omaha Gas Company of Omaha, Nebraska, and more recently general manager of the Council Bluffs Gas Company of Council Bluffs, Iowa, has been appointed as general commercial manager of the Texas Cities Gas Company of Dallas, Texas.

H. M. Godsey has also been appointed industrial engineer for the company. Prior to April 1, when his appointment became effective, Mr. Godsey was engaged in the sale of an industrial gas burner of his own manufacture. He has also seen service as an industrial engineer at Shreveport, Louisiana.

These two men will make their headquarters at Dallas, but will divide their time between the properties controlled by the company, including the gas distributing systems at Galveston, Brenham, El Paso, Waco and Paris, Texas. The Texas Cities is a subsidiary of the Union Utilities Inc., of New York.

NO. CALIFORNIA COMPANIES IN CLEANLINESS CAMPAIGN

The H. R. Basford Company in San Francisco, and the Pollard Segrave Company in Oakland held meetings in their respective cities early in April, to which were invited a number of gas appliance dealers and master and journeymen plumbers. The meetings inaugurated the Ruud cleanliness campaign in Northern California. The first meeting was held in Oakland, with 150 present; a second meeting was held in San Francisco, with over 250 attending. The program was the same in both instances, being a dinner, followed by songs and stunts. Three very characteristic sketches were offered, featuring the moral that any salesman can make a sale if he exposes himself to enough prospects. Al Rice, of the Basford Company, demonstrated a Tappan range, at the same time urging plumbers to send in prospects for this merchandise. George Egleston and Harold Basford, both of the Basford Company, spoke.

U. S. BUREAU OF MINES MAPS NATURAL GAS PIPELINES

In response to a widespread demand for information regarding the location of natural gas pipelines, the United States Bureau of Mines, Department of Commerce, has been assembling information from the transporting companies regarding the location of their individual lines. The information has been transferred from company maps to base maps and the work is virtually complete so that the map should be ready for distribution before the end of the fiscal year. It is being printed for the Bureau by the United States Geological Survey.

P. G. AND E. SALES CREW GIVEN DINNER

The sales crew of the East Bay Division of the Pacific Gas and Electric Company of San Francisco, California, were entertained on April 10, with a dinner given by the Pittsburg Water Heater Company.

PECOS VALLEY GAS COMPANY HAS COOKING DEMONSTRATION

The Moore Stove Company of Joliet, Illinois, held a cooking demonstration and school at Carlsbad, New Mexico, at the office of the Pecos Valley Gas Company. Natural gas was turned into the mains at Carlsbad in January, and to date over 300 meters have been set.

U. G. I. COMPANY REPORTS 89 PER CENT INCREASE

In its 47th Annual Report to the stockholders, the United Gas Improvement Company with headquarters in Philadelphia, Pennsylvania, showed a net operating income of $21,015,271 for 1928 or an increase of 89 per cent over 1927. The report, which is signed by John E. Zimmerman, president of the company, explains that the large percentage of increase "reflects the effect of acquiring the Philadelphia Electric Company in February, 1928, by exchange of stocks."

The report shows that the company realized profits during the year from the sale of securities and other non-recurring income of $15,348,369. Mr. Zimmerman, in his comments on the report calls attention to an appended chart, which shows that there has been no interruption in U. G. I. dividends since the first payment in 1885, the average cash dividend for the 44 year period being 7.77 per cent, in addition to dividends paid from time to time in convertible scrip, or in stock.

As of December 31, 1928, the U. G. I had outstanding 3,944,459 shares of capital stock with assets of $257,186,004.14, and a total surplus of $45,416,987.45. Assets of the company and its subsidiaries totaled $681,-980,876.64.

B. F. BART MAKES AIR SURVEY OF FT. WORTH LINE

A survey, which in former years would have consumed several weeks was accomplished in a few hours recently, when B. F. Bart, representing the A. O. Smith Corporation, flew over the proposed route of the 135-mile gas pipeline from Petrolia, Texas, to Fort Worth and Dallas. With the names of the towns along the route and a flying map to guide him, he examined the route, inspecting the various types of country through which the line will be laid. The project means the expenditure of about two million dollars. Company officials stated that Mr. Bart returned from the flight with sufficient information to figure the cost of the entire line.

CONSUMERS GAS CO. OPENS NEW OFFICE AT MIAMI, OKLA.

The formal opening of the new office of the Consumers Gas Company at Miami, Oklahoma, was held April 2, open house continuing throughout the week. R. E. Holland, manager of the company stated that over 1500 people visited the new office and sales room. The company now has a total of 24 employees, serving over 1800 customers. Two branch offices are maintained, one in Pitcher, Oklahoma, the other in Chetopa, Kansas.

T. J. STRICKLER SERVES AT 3RD ANNUAL SAFETY CONGRESS

The third annual Central States Safety Congress and Exhibit was held April 30 and May 1 in Kansas City, Missouri. T. J. Strickler, vice-president and general manager of the Kansas City Gas Company, and president of the Kansas City Safety Council, acted as chairman of the first general session on April 30.

DURANGO, COLO., NATURAL GAS LINE UNDER WAY

The Hope Engineering Company has resumed its work on the construction of a natural gas pipeline from Ute Pasture Wells in New Mexico to Durango, Colorado.

Alexander Forward A.GA.. Managing Director

F. M. Rosencrans Committee Chairman Convention Exhibition

A. W. Leonard Committee Chairman Convention Program

Natural Gas Men Welcomed *to* Kansas City

(Continued from Page 49)

way, they will be glad to extend their fullest cooperation if delegates will make their wishes known.

Again to visiting natural gas men we say: "We want to make your visit to our city so enjoyable and beneficial that you will come more often. We welcome you most heartily to Kansas City and to the Natural Gas Convention and hope that you will leave our community with the most pleasant of memories associated with your sojourn in the 'Heart of America'."

Convention Hall, display center for Natural Gas Exhibition

LACLEDE GAS LIGHT CO. FILES NEW RATE SCHEDULE

A new schedule of gas rates has been filed with the Missouri Public Service Commission by the Laclede Gas Light Company, of St. Louis, Missouri. The new rates would mean an increase in monthly bills for all consumers of less than 6500 cubic feet, but where consumption is over that amount, the bills would be noticeably lower. About 95 per cent of the company's 200,000 consumers are in the first group, and will be affected by the increase. The new rates also include a special schedule for residence heating service which will apply only to buildings having not less than 15,000 cubic feet of volume.

WINNIPEG ELECT. CO. TO SPEND $100,000 ON GAS IMPROVEMENTS

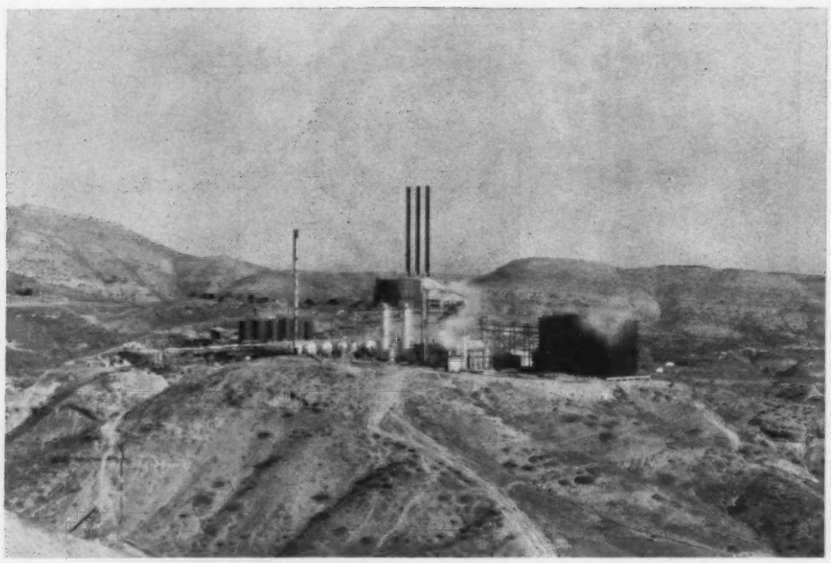
Announcement has just been made by the Winnipeg Electric Company of Winnipeg, Canada, that it proposes to spend $100,000 on the local gas utilitity this year.

LONGVIEW, WASH., GRANTS GAS FRANCHISE TO D. C. TENNEY

The city of Longview, Washington, has granted a franchise for the service of manufactured and natural gas to D. C. Tenney, representing the American Gas Construction Company. The franchise provides that acceptance of the franchise must be made within 30 days from the date of issue, and that construction work will begin within a period of six months. The permit was granted for 25 years.

STANDARD GAS AND ELECTRIC CO. EARNINGS INCREASE

Standard Gas and Electric Company, with headquarters in Chicago, Illinois, has issued its Annual Report. Net earnings for 1928 are listed at $72,510,920, as compared with $65,357,964 for 1927, showing a gain of $7,-152,956 for 1928. The company, with its subsidiaries, closed the year with combined assets of $1,054,000,000.



First unit of Texas Company absorption plant in Kettleman Hills field, Calif., where gasoline content will be removed from gas supplying Pacific Gas and Electric Company line to northern California cities

Progress *on* P. G. *and* E. Line

(Continued from Page 61)

and valves are being installed to accommodate the additional compressor station, when future needs require it.

One of the features of the line designed to guard against any interruption is a complete telephone system being installed by the company parelleling the project for its entire length. A field telephone will be located at every valve along the line, these being about five miles apart over flat level country, and about two miles apart in the mountainous and wooded sections.

Gas arrives at the various plants where the reforming process is to be carried on at about 25 to 75 pounds pressure. This gas will have a B.t.u. content that will average about 1150.

REFORMING GAS

There are a number of reasons why the gas to be supplied in San Jose, San Francisco and Oakland is a mixed reformed gas rather than straight natural. The impracticability of having the entire gas supply of tor. The difficulties that would be encountered by consumers in changing immediately, with their present appliances, to such a high B.t.u. fuel is another, and a third and very important reason is that a tremendous storage capacity would be required to guard against a short interruption of service or shut down of the line if the cities were using only straight natural gas.

Although the present oil generators might be maintained as standby equipment, great difficulty would be encountered if in emergencies consumers were obliged without warning to try and burn oil gas where they had been burning natural gas before.

Fortunately, the oil gas now being made is of practically the same analysis and specific gravity as the 550 B.t.u. reformed gas that will be made. Thus it can be seen that in the case of an emergency, generators which have been reforming natural gas can be changed over to the manufacture of oil gas. This can then be mixed with a small amount of 1150 B.t.u. gas in the storage holders, thus maintaining an uninterrupted send out of 700 B.t.u. fuel. A 550 B.t.u. gas was found to be the most economical output for our present two-shell generators when reforming natural gas.

Upon reaching the plant, gas passes through a manually controlled Nordstrom valve for positive shutoff and a motor operated gate valve with push button control for emergency use; push buttons being located at strategic points throughout the plant. Necessary plant pipe is being installed to bring gas to the storage holder, mixing holder, generators and boilers, each branch having its own control regulators and meters.

The same general plant equipment will be used for reforming as is now being used for oil gas manufacture. It has been calculated that the generators will operate on practically the same cycle, but it is interesting to note that a slightly higher temperature is required to reform natural gas than to make oil gas. The generators are being equipped with natural gas intakes without in any way disturbing the connections for introducing oil. Practically the same personnel will be required to man the plants.

Some idea of the magnitude of the plant changes may be gathered when it is considered that in San Jose, San Francisco and Oakland over a thousand valves, ranging in size from 2½ to 36 inches will be required. There will be 12 regulators, 10 station type of meters, and 54 control orifices. Each of the two larger plants will require two new turbine driven centrifugal boosters. These boosters have a capacity of 1,000,000,000 cubic feet each and are to be operated in parallel, delivering up to 18 pounds pressure at .65 specific gravity. They are equipped with full automatic volume and pressure control. This is the first time that this company has operated centrifugal boosters at this pressure and at the high speed of 13,500 r.p.m.

The P. G. and E. is laying its own foundations for the Oakland and San Francisco holders. The 8,000,000 cubic foot Oakland holder, resting as it does on tide land, requires 1842 20-foot compressed concrete piles to carry the load of the foundation slab and holder. No such difficulty is being encountered in San Francisco, however, as the 10,000,000 cubic foot holder there will rest on bed rock.

AUTOMATIC MIXING

The mixing of reformed gas with the straight natural gas is accomplished by apparatus entirely automatic in operation. These automatic mixing valves test the reformed gas for B.t.u. content and alter the mixture to maintain a constant heating value in the mixture that flows into the lines, irrespective of the rate of generator operation or of the B.t.u. of the gas produced.

Fresno, being near the natural gas fields, will be served straight natural gas. All appliances will require adjusting and plans are being made for dividing the city into sections, so that one given area will be converted to natural gas service at a time. Then another section will be converted until finally all the gas consumers in Fresno will be receiving natural gas.

Upon completion of the line, 370,000 gas consumers in Northern California will have their gas gradually stepped up in B.t.u.'s over a period of several days, until finally the 700 B.t.u. gas service is established. Specially trained appliance men will be ready to follow the introduction of the new gas and make adjustments wherever necessary and in order that the change-over may made with the least possible inconvenience to the consumers

It might be said in closing that the line is now proceeding at a rate which indicates that it will be finished slightly ahead of the scheduled date of August 1.

PUBLIC UTILITIES COURSE ENROLLS 400 L. A. G. AND E. EMPLOYEES

Over 400 employees from all departments of the Los Angeles Gas and Electric Corporation enrolled in a course on Public Utility Practices which held its first meeting on March 1. Five other meetings were held one week apart, at the close of which an examination was given. The subjects treated included Correct Utility of Gas, Commercial Practices, Public Relations of Public Utilities, Load Building, Recent Developments in the Gas Industry. Rewards for the best work in examinations were given by the company, the first prize being a trip to the Pacific Coast Gas Association convention at Del Monte and was won by N. A. Seeley of the valuation department. The second prize of $25 was won by C. E. Crabill. President Addison B. Day awarded the prizes.

1929 Calendar

Arkansas Utilities Association—Hot Springs, Ark., April 30-May 3, 1929.

Natural Gas Dept., A. G. A.—Kansas City, May 6-10, 1929.

Natural Gasoline Association of America—Tulsa, Oklahoma, May 21-22.

Joint Production and Chemical Conference, A. G. A.—Chicago, May 27, 28, 29, 1929.

Northwest Conference, Pacific Coast Gas Association—Victoria, British Columbia, June 7-8, 1929.

Canadian Gas Association—Ottawa, Canada, June 13-14, 1929.

Pacific Coast Gas Association, Annual Convention—Del Monte, Calif., September 10-13, 1929.

American Gas Association—Atlantic City, October 14-19, 1929.

Utilities Association Secretaries of the United States—Chicago, December, 1929.

GAS BUREAU HAS EXHIBIT AT SO. CAL. FOOD SHOW

At the Fifth Annual Southern California Food Show, held at the Hotel Ambassador Auditorium in Los Angeles from April 21 to April 27, the Southern California Gas Bureau, representing the Southern Counties Gas Company, Southern California Gas Company and Los Angeles Gas & Electric Corporation, maintained a cooperative exhibit. The three companies established a beautiful merchandising booth in which modern gas burning equipment for the home was shown, including gas-fired refrigerators, gas ranges and other appliances.

Cooperating with the Gas Bureau are the Welsbach Company, Tappan Stove Company, C. B. Babcock Company, Estate Range Company, Clark Jewel Range Company and Northwest Gas & Electric Equipment Company.

The booth was designed by Frank Moon, architect and contact man for the Los Angeles Gas & Electric Corporation. The execution of the plan was made by Mr. Moon in conjunction with J. E. Kern, refrigeration engineer of the Southern California Gas Company and D. L. Leahy, Industrial Department of the Southern Counties Gas Company.

C. M. Grow, new business manager of the Southern California Gas Company, is chairman of the Gas Bureau.

GAINSVILLE-ST. JO GAS LINE TO BE BUILT BY LONE STAR

A new gas pipeline is to be built from Gainesville, Texas, through portions of Cooke and Montague counties to supply Lindsay, Myra, Muenster and St. Jo, all in Texas, according to announcement by the Lone Star Gas Company.

These towns, which are being added to the pipeline system of the Lone Star Company, will be operated by the Community Natural Gas Company, which distributes gas in about 180 towns and cities of Texas and Oklahoma. St. Jo will be established as headquarters for the district.

This line will connect with the 16-inch main line of the Lone Star Company at Gainesville, and consumers of the district will thus have gas available from the 21 gas fields of the pipeline system.

1928 Development *in* Oklahoma

(Continued from Page 67)

Development of the great and almost inexhaustible natural gas fields in the Texas Panhandle has proven to be a great boone to western Oklahoma as it has to hundreds of towns in Texas, Colorado, Kansas and Missouri. Great pipelines have been extended in every direction from this field, including lines completed in 1928 to Denver, Enid, Oklahoma and Kansas City. The latter line, constructed by the Cities Service Gas Company, was completed from Pampa, Texas to Wichita, Kansas during 1927, and the extension from Wichita to Kansas City was completed last year. This is one of the longest gas lines in the United States, covering a distance of 450 miles and carrying gas to more than 100 cities and towns in Oklahoma, Kansas and Missouri. About 125 miles of this line pass through northwestern Oklahoma.

The largest Oklahoma natural gas construction project during 1928 was the laying of the 14-inch line of the Consolidated Gas Utilities Company from Wheeler County, Texas to Enid, Okla., a distance of 165 miles. This line was completed and put into service November 1 and brought natural gas for the first time to Weatherford, Thomas, Custer City, Watonga, Southard, Okeene, Canton and Fairview, all in western Oklahoma. This line also brought an additional supply of gas to Enid, and many other cities in northern Oklahoma and southern Kansas, a number of which are not served directly by the Consolidated Gas Utilities Company.

Included in this project were five new compressor stations with a total capacity of 6,120 horsepower, located at Carpenter, Eagle City, Enid, Deer Creek field, and Oklahoma-Kansas state line. The Consolidated Gas Utilities Company has large lease holdings and valuable gas purchasing contracts in several fields comprising 84,000 acres including holdings in the Texas fields, in three important Oklahoma gas fields and in the shale gas area in southeastern Kansas. In addition to the towns to which gas was brought for the first time this company serves a large number of other towns in Oklahoma and Kansas on lines which it acquired through purchase from other companies. Logan W. Carv, Oklahoma City, is president; Wilbur J. Holleman, Oklahoma City, is secretary, and S. Miller Williams, Tulsa, is chairman of the board of directors of the Consolidated Gas Utilities Company.

Addition of 500 miles of natural gas transmission lines in Oklahoma in 1928 brought the total mileage of the State to over 7,000. This mileage does not include distribution systems which serve approximately 280 cities and towns in the State. Natural gas service has been developed to an exact science by most companies in Oklahoma. This was demonstrated during the past winter when the records of many years were broken for sustained cold water. During the entire winter less than a dozen towns experienced gas shortages and in few of these was the trouble serious.

The natural gas industry in Oklahoma has attained a greater degree of stability than during any previous period of its history and the public relations of the companies are better than ever before. Regardless of the fact, however, that Oklahoma leads in the production of natural gas and has maintained this position for a number of years, most franchises being secured contain a provision for serving manufactured gas, if the natural gas supply should fail. While there seems no prospect for such a failure, at least for many years, yet companies operating here will not permit themselves to be lulled into a sense of security from which they might be rudely awakened later on. Rapid increase in the length, size and number of gas transmission lines makes ever increasing demands on the great natural gas reserves of the Southwest and no one can foretell how long these fields will continue to pour forth the magic fuel.

The Oklahoma legislature in March passed a law which permits gas companies to pipe natural gas out of the State. While some of the companies which possess this right before the State was admitted, were piping gas to other States, many others were restricted from doing so. Advocates of the measure claimed that this constituted an unfair discrimination; also that there were many gas wells in Oklahoma which were not connected to pipe lines because no market could be found for the gas. This, it was contended, was a great economic loss to Oklahoma. Opponents of the measure expressed the fear that Oklahoma's great gas fields would soon be exhausted by piping gas to other States and that higher prices for gas for domestic and industrial consumption in Oklahoma would folow. The legislature however seemed to be little impressed by the arguments of the opponents of the bill as the measure passed both houses by large majorities and was signed by the then acting governor, March 4, without hesitation or comment, although a similar bill had been vetoed by former Governor Johnston two years previously.

DR. WALTER DEXTER GIVES SALES TALKS AT SO. COUNTIES MEETING

Dr. Walter Dexter, president of Whittier College, was the principal speaker before the April sales meeting of the Southern Counties Gas Company, held in Los Angeles, California, on the evening of Thursday, April 18. Dr. Dexter spoke on "The Value of Modern Selling" and presented a helpful view of the sales problems of today.

Dr. Dexter was introduced by W. G. Rich, district manager of the Company at Whittier. Harry Carroll, past president of the Advertising Club of Los Angeles, also presented a sales talk.

Clyde H. Potter, commercial manager of the company, opened the meeting. Mr. Potter in commenting upon sales work in 1929, predicted the sale of more than 600 gas-fired refrigerators on the company's lines this year.

Vice-president Frank H. Bivens, in charge of sales and public relations, reviewed sales efforts during the first quarter of 1929.

SHELBY-SEATTLE NATURAL GAS LINE IS RUMORED

A project for a gas pipeline running from Shelby, Montana, to Seattle, Washington, is rumored in recent Montana press reports, which state that the line would serve several Montana towns enroute, including Avon and Missoula. Spokane and Seattle, Washington, would provide a large market for natural gas from fields in northern Montana. James R. Bahan, consulting engineer of Shreveport, Louisiana, and Harry K. Ihrig, of Pittsburgh, Pennsylvania, are stated to have been making a survey of the proposed line.

MONTHLY SUMMARY OF COMPRESSOR STATION OPERATION—LONE STAR GAS COMPANY
Month of December, 1928

Station	Eng. Hrs. Installed	Eng. Hrs. Operated	Engine Days	Per Cent Operating	Average Pressure Low	Int.	High	M Gas Fuel	M Gas Net	M³ Gas Comp. Per Eng. Day	Labor Cost Per Eng Day	Gals. Oil Used	Oil Per Engine Day	H.P. Hrs. Per Gallon
Pet					.005	15	179							
Dun						97	275							
Petrolia S. R.														
W. G.	8184	5776	120.0	70.3	..	..	...	27579	817855	6.810	57.60	1018.25	8.480	6640
Gas City	10416	5503	229.2	51.3	3	46	212	8571	143997	.628	7.24	90.50	.395	9720
Fox East	4464	4004	166.6	89.7	..	41	281	3663	90093	.541	6.29	143.50	.862	4460
Fox Central	10416	7618	317.1	73.1	..	43	275	6981	211786	.668	7.70	202.75	.640	6000
Loco	5952	2109	87.8	35.4	7	39	268	2715	51900	.592	9.63	97.50	1.110	3460
Brazos	2232	2133	88.8	95.6	15	71	287	3337	66513	.750	3.74	38.25	.442	8690
Ranger No. 1	5208	3000	125.0	57.7	18	88	317	4351	108134	.864	6.49	83.50	.668	5750
Ranger No. 2	3720	56	2.3	.1	22	89	318	658	4479	1.947	6.67	1.00	.435	8830
Ranger No. 3	10416	7273	303.0	69.8	17	90	332	14005	228721	.756	6.49	153.00	.506	7480
Ranger No. 4	6696	3828	159.3	57.2	22	99	340	6576	160233	1.005	6.49	96.25	.604	6350
Ibex	17856	7816	325.5	43.8	..	79	347	14863	526368	1.617	5.46	168.50	.518	7410
Joshua	11904	8513	355.0	71.5	10	50	236	13455	248270	.700	5.85	250.00	.704	5450
Irving	2976	....	....	....	..	..	...	....	.....	....	....	.....	....	....
Desdemona	2232	1483	61.8	66.5	7	54	309	1547	33057	.535	8.12	23.25	.376	10200
Breckenridge	11904	2196	91.5	18.4	22	91	321	3517	97046	1.061	9.99	11.25	.123	31200
Caddo	8928	4031	168.0	45.2	20	85	309	5813	141467	.842	7.98	23.25	.138	27800
Moran	1488	....	....	....	..	..	...	....	.....	....	....	.....	....	....
Parks	4464	....	....	....	..	..	...	....	.....	....	....	.....	....	....
Eastland	3720	3563	148.4	95.8	6	71	346	7137	155640	1.048	4.54	162.25	1.093	3510
Cheaney	4464	2231	92.9	50.0	10	29	320	3627	38799	.422	9.15	149.50	1.610	2380
Totals	137640	71138	2842.2	....	..	..	...	128401	3124358	....	....	2713.50	....	....
Averages	...	....	....	51.6	..	..	...	....	.....	*.847	*9.42	.....	*.622	6364

Compressor Station Personnel

(*Continued from Page 65*)

"to pay for approved correspondence courses when those courses are completed."

Having it thoroughly understood that a man never becomes so valuable to us that he can afford to be hard to get along with, and that we will play no favorites has resulted in a loyalty, an "esprit de corps" which is seldom met with anywhere.

It at once became necessary that a monthly report be made to the operating manager summarizing the operation of compressor stations, and it was decided that no better way to stimulate interest could be found, than to furnish an exact copy of this summary of operation to each plant. The summary gave the information below (also see typical summary for month of December, 1928 reproduced with this article), and was due about the 15th of the month following the period covered.

Possible engine hours, hours operated, per cent operation, average suction pressure, average discharge pressure, fuel used, gas compressed, oil used, fuel per M^2 gas compressed, gas compressed per engine day, total pay roll, rated H.P. hours per gal. oil.

This information furnished to each plant for the previous month's operation enabled the man in charge at each plant to compare the operation of that plant with all others. This is done at weekly conferences of operating engineers—an essential part of our program. The enormous advantage of this course was so quickly apparent in improved efficiencies and economics that many other reports, even monthly analysis of expense by account numbers, are now furnished.

Curve sheets of operation, of oil and fuel consumption, of gas output are furnished and also total operating expenses graphically represented by months, using different colors of ink to represent different years, have been made, with the idea of making the operating cost conform to the seasonal variation in the gas demand. The result has been that not only has total opeating cost for the system conformed to that demand curve but the cost has shown a gratifying reduction annually.

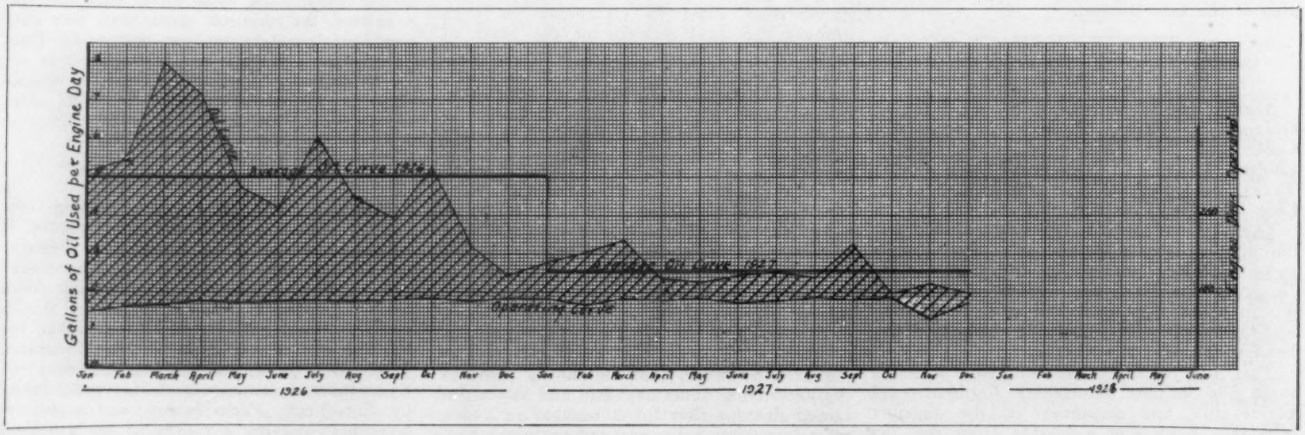
In the matter of oil economy we recommend the gradual reduction of feeds to the economical point, so that the operators shall be constantly sold on the idea that it is being done judiciouly and that they may note that maintenance costs are following the same downward trend.

The examples shown of typical graphs will doubtless illustrate the way in which we have been able to bring about a flatter curve of oil and fuel economy, showing less fluctuation from month to month than we obtained formerly. The improvement in this respect is even more marked for the year 1928, which is not included in the examples shown.

As the result of much thought and study on the part of many members of the organization, stimulated by the reports and graphs, we believe, the following results are cited.

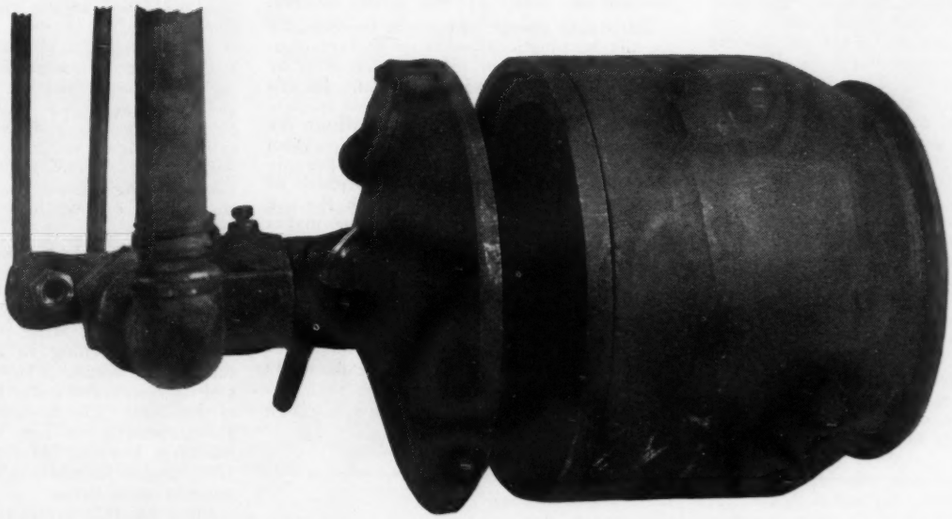
Between 1924 and 1929 the number of compressor stations increased from 13 to 25. The increase in H.P. was 52 per cent. Lubricating costs consistently decreased 42 per cent with a decrease in cost of maintenance of machinery of 30 per cent and a reduction in total operating expense of 11 per cent.

The district engineers are all proud of this record and at the first monthly meeting after the big gas demand period, expressed themselves as confident that they have barely


Gallons of Oil Used per Engine Day
Engine Day Expended
Average Oil Curve 1926
Average Oil Curve 1927
Operating Curve
Jan Feb March April May June July Aug Sept Oct Nov Dec Jan Feb March April May June July Aug Sept Oct Nov Dec Jan Feb March April May June
1926
1927
1928

Comparison of oil economy curve to operating curve, Desdemona compressor station, Lone Star Gas Company

Forney Combination Gas and Oil Burner
FOR
Power Plant and Industrial Uses



10 Reasons Why The Forney Combination Gas and Oil Burner Is Being Used by the Largest Central Stations in the Southwest:

1—High evaporative efficiency for both gas and oil.
2—Flexibility of change-over from one fuel to another.
3—High overload capacity.
4—No pulsations.
5—No flame travel with gas.
6—Easily and quickly cleaned in case of dirt in the gas lines.
7—Ruggedness of construction and simplicity of operation.
8—Engineering service which insures most effective installation and permanently satisfactory results.
9—Low initial cost.
10—Low maintenance cost.

Write for literature and list of installations

Forney Combustion Engineering Company

305 Thomas Bldg., Dallas, Texas

scratched the surface of the possibilities for improved efficiencies and economics. It is most gratifying to note the obvious improvement in the men individually, to note the confidence and air of determination with which they attack each new problem, always with a definite object in view, operating improvement and operating cost reduction.

Gas *in* Chinaware Manufacture

(*Continued from Page 57*)

the use of gas for fuel, and a still greater saving could be made in fuel cost and time. This is not only true of the bisque and glost ware, but the decorated ware can be fired with gas without the use of the muffle, and at least a 30 per cent saving to the manufacturer can be enjoyed. This statement has already been proven in the burning of terra cotta by the direct fire method.

It is true that certain grades of chinaware are perhaps more delicate than terra cotta, but at the same time the atmosphere can be kept so absolutely clean with the use of gas that the most delicate ceramic wares can be fired without the aid of muffles or refrectory containers.

As for burner equipment, many types and kinds are used. Some manufacturers hold that the atmospheric type of burner fulfills their requirement at a reasonable cost. Others hold that the low pressure type to be used with blower equipment is more suitable, and both can be right. A great deal depends upon the class of ware and the type of kiln used, but in any case it is found, both from the standpoint of economy and furnace control, that the lower the gas pressure, the better are the results secured.

The writer prefers, wherever possible, the pre-mix burning equipment or surface combustion, by reason of the fact that is is by far the more flexible in operation. In this particular type of burning, oxidation is quite essential. In fact, any reduction within the kiln's atmosphere would be ruinous. With the low pressure type burner of the pre-mix type, one can keep the kiln atmosphere as oxidizing as desired, whereas with the use of a high temperature fire on some makes of atmospheric burners on kilns, one may be hampered by choke draft conditions and other handicaps which are quite likely to show considerable reducing kiln atmospheric conditions.

In any case, however, each job has to be analyzed on its merits, and before definitely deciding upon any equipment, one will certainly be compensated by making a thorough study of all existing conditions.

Load Building *in* Denver

(*Continued from Page 59*)

mate request card is then stamped with the master number and sent to the Gas Distribution Department as notification of an expected load at that address. As a rule, it is not necessary to obtain the Operating Department approval for installations under 300 cu. ft. per hour total demand. A survey car (Fig. 3) is then given the master number and passed to the Estimating Division. At the time set by the customer, an estimating engineer and his assistant visit the customer's home and measure the house, recording all details, such as, plan views of each floor, window sizes, exposure, radiation in each room, weather stripped or not, etc. For convenience in sketching, the rear of the survey card is cross-ruled and a scale of 2 feet per ¼-inch square taken as standard.

Upon return to the office, the estimator calculates from the data just obtained the hourly heat loss in B.t.u.'s, using an outside temperature of minus 10 degrees The monthly and yearly gas consumption for heating alone is then calculated, the estimated domestic consumption added and results tabulated on the house-heating estimate sheet (Fig. 4). Any recommendations toward improving heating conditions, such as additional cold air return ducts, etc., are noted on this estimate sheet, together with equipment and installation cost, and the sheet, in triplicate, given to the house-heating salesman assigned to the district in which the customer is located. The salesman then applies his arts and brings home the order to make the installation (in most cases). An installation order is written on the Utilization Department, the division of the Gas Operating Department charged with installation and maintenance of house-heating equipment, and the work is speedily completed. After completion of the work, the installation order returns to the House Heating Department.

The master card carries a complete history of the particular home, insofar as gas for heating is concerned, the date the tip was received, date of issuing of survey card and completion of survey work, when the estimate was given to the salesman, receipt of signed order, issuing of installation order to the Operating Department, date of completion of installation, subcontractors called upon by the Operating Department to do the work, etc.

SALES TRAINING

Especial attention is given to training of estimators and salesmen. Specific schooling is given the newer men by the group head or one designated by him. General information is available in the meetings held every morning, each division meeting separately, except on Monday morning when a general meeting is held. Once a week, evening meetings are held and theory and practice of each job discussed. In some cases, written examinations are given, the men making the best grades getting small prizes. "The Gas Pilot," a daily sheet gotten out by the Commercial Department and widely circulated throughout the company, gives the results obtained by each salesman and pertinent data on house-heating subjects.

To sell goods requires an organization, and the efficiency of the Commercial Department organization is mirrored by their results. Under the direction of Roy G. Munroe are the groups previously mentioned. The House Heating Division includes one superintendent, 10 estimating engineers, three clerks, one office salesman and 30 house-heating representatives or salesmen. In the Industrial Fuel Division are 12 salesmen and engineers. The Domestic Division has 25 representatives. In addition, two general clerks aid all groups. An architects' and builders' engineer is also included, whose duty it is to aid sales by contacting architects, builders, plumbers and steam fitters, explaining the advantages of natural gas and attempting to get gas equipment specified or installed by them.

The publicity program followed included a liberal use of newspaper advertising, booklets, bill boards and similar devices. The assistance rendered the Commercial Department by this program was more than satisfactory.

During the year 1928, a total of 3040 house-heating installations were made, including 455 gas-designed boilers or furnaces and 2098 conversions. The Industrial Fuel Department sold 100 all-gas industrial space-heating jobs, 903 burners, 22 automatic storage water heaters for industrial purposes and more than 130 miscellaneous appliances, in addition to 22 large industrial customers, the largest burning in excess of 8,000,000 cu. ft. per month. Fifty-eight hotel ranges and 22 restaurant water heaters were added to the lines. The Domestic Division placed 938 automatic storage water heaters, 708 side arm heaters, 763 fireplace heaters and 1786 ranges, in addition to several hundred miscellaneous items.

Plans for 1929 are to continue the methods used during the past year. The first step, that of educating the public to the convenience and low cost of natural gas as a source of heat, has been nearly surmounted. The question of cost has been pushed out of the picture by the new fuel. Service without one second's interruption during the coldest heating season in 30 years has quieted the doubting Thomases who feared a scarcity of gas on frosty mornings. Methods have been polished up, and a year's experience carefully studied that sales volume may be increased and costs sent tumbling. System and hard, closely-directed work broke a record last year, and A.D. 1929 will see more system, harder work and bigger and better records.

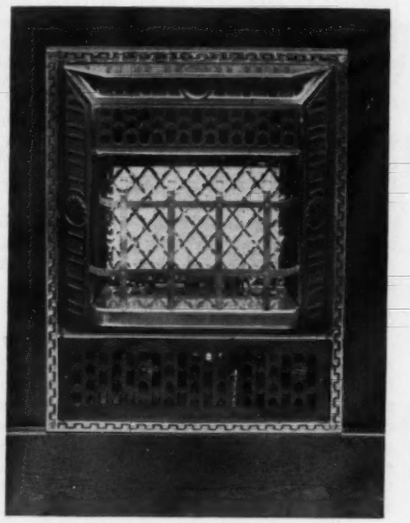
EIGHTH ANNUAL GAS RANGE WEEK IS SUCCESS

A snap check-up immediately following the conclusion of the Eighth Annual Gas Range Week of the Gas Appliance Society, of northern California, held April 15-20, indicates that the results this year, are gratifying. Reports from dealers and stove manufacturers and manufacturers' agents indicate that about twice as many ranges were sold this year than during the same campaign in 1928. It is apparent also that higher priced merchandise was sold, a higher percentage of sales being full enameled ranges.

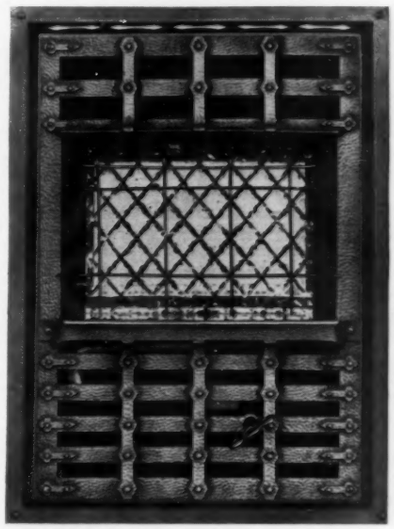
The San Francisco campaign was conducted by C. P. Hering, secretary of the San Francisco unit, assisted by Roy Ohnimus and Ed Hinchey. In previous years no effort was made to concentrate particularly on stoves, but the 1929 campaign was devoted entirely to gas range sales.

Later in the summer, a water heater campaign will be undertaken, and house heating will receive individual attention in the early fall of this year.

Now! Wall Heaters with A. G. A. Approval



The latest addition to the "Pacific" line of Gas Heating Equipment are the new Models 7, and 8-A Wall Heaters. These beautiful new Heaters have been thoroughly tested by the laboratory of the American Gas Association, and they now bear the "Blue Star" stamp of approval. They are equipped with the Multi-tubular burner which has proven so popular and efficient in other "Pacific" products. The attractive appearance and sturdy construction coupled with its efficiency in rendering cheerful heat will prove a quick seller and should be displayed on your sales floor.

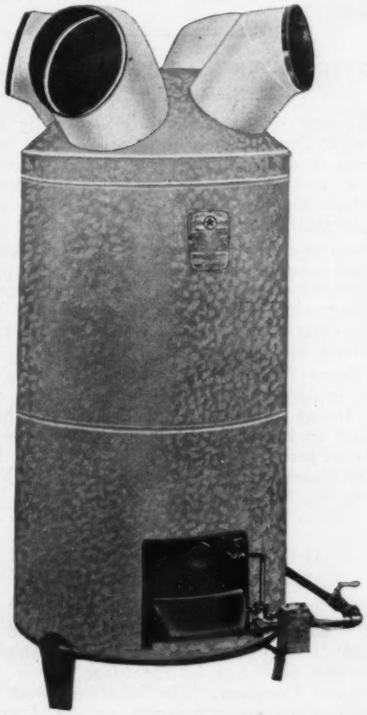


The Multi-Tubular Burner

Each burner has its independent injection of gas. Primary air for combustion is directly siphoned at each individual burner. There is no need for adjusting of the gas and air for combustion, as this new Pacific Burner is scientifically designed to automatically give the correct proportion of air to gas. This results in complete combustion and a high temperature flame of proven economy. No soot. No odors.

By Selling the Complete Pacific Line You Have the Advantage

Because with the complete Pacific line you can offer the correct solution to every heating problem. Where other heating salesmen stress their particular appliance, our agent selects from a full line the appliance best suited. We have a real money making proposition. Write for particulars.



A. G. A. approved Unit Furnace

The Pacific Furnace, with the recognized advantages of the "round" design, eliminates all corners and dead air spaces. It promotes better circulation, giving an abundance of heat more quickly. The heating element is completely welded throughout, is gas tight, and permits no combustion fumes to escape. The heating unit is of 20-gauge pure Ingot Iron metal.

"Pacific" Unvented Gas Steam Radiators

The Pacific Unvented Gas Steam Radiators are now available in four column pattern. A size for every demand, 26, 32, and 38 inches high. The Pacific Gas Steam Radiator has been passed and approved by both the laboratory of the American Gas Association and the Underwriters Laboratories as well.

Our agency proposition is very attractive—write for particulars concerning your locality.

Get in on Every Heating Job in Your Territory

Pacific Gas Radiator

Gas Heating **Company** *Headquarters*

Roseberry and Walter Streets, Huntington Park, California

Manufacturers of Every Type of Gas Heating Appliances

Gas *in the* Convention City

(Continued from Page 55)

great extent, the growth the company now enjoys. Most of the load, however, has been put on our lines the last few years. The personnel of the new business or sales department has been increased six times over what it was three and a half years ago.

Four years ago, 4,047,035,000 cubic feet of gas were sold, of which 31,949,000 cubic feet were for house heating and 25,090,000 cubic feet for industrial use. The figures for 1928 show somewhat of a contrast—7,818,-761,000 cubic feet sold, of which 677,792,000 cubic feet were for house heating and 3,-152,407,000 cubic feet were for industrial purposes.

For the last three years much attention has been directed to the 12 month industrial load. Individual surveys were made of all industrial concerns; their particular problems were analyzed and today the majority of them are using gas throughout their plants. Following are a few of the nationally known concerns which are among our largest users: The Sheffield Steel Company, Standard Oil Company (Indiana), Armour and Company, Sinclair Refinery, Cudahy Packing Company, Ford Motor Company, Wilson and Company, Inc., Corn Products Refining Company, Chevrolet Motor Company, American Radiator Company, National Biscuit Company, Union Wire Rope Company, Seidlitz Paint & Varnish Company and Missouri Portland Cement Company.

Kansas City is fast becoming the industrial center of the Southwest and it is anticipated that the industrial gas consumption in 1929 will be more than five billion cubic feet.

Recently, a new house heating rate became effective which will open the way to the prospective addition of approximately 8,000 heating installations. It is believed that the house heating consumption will be more than a billion cubic feet this year.

The Kansas City Gas Company is looking forward to a banner year in 1929. Eleven and one half billion cubic feet will be our goal.

A District Managers' Contest

(Continued from Page 63)

With the view of keeping the contest equitable from the standpoint of all districts, the list of appliances which will count in establishing the progress of each contestant in the flight was limited to domestic gas ranges, automatic storage water heaters, gas-operated refrigerators and space heaters. This point was thoroughly understood by the eight flight pilots at the take-off.

Interest injected into this contest by making it revolve around the district managers has been evident from the outset. Announcement of the set-up of the seven-month selling competition was made at the monthly sales meeting preceding the opening date, February 1. Progress of the several entries has been recorded on the chart shown above since the latter date, some of the swifter planes remaining safely ahead of schedule and a number of others encountering engine trouble, weather inclemency or some other factor which operated to retard the selling pace. The flight leader at the end of the first month had set up 54.8 cents per meter as his district sales record. Low district for the month had sales of 25.9 cents per meter to its credit. At the end of the second month the leading district had reached the 97.7 cents per meter mark for the contest to that date, with the low district at 60.2 cents per meter. Refrigerator and water heater sales in April were expected to show gains in all districts, with every pilot endeavoring to reach the Kansas City refueling point by the due date, April 30.

It is significant to note that interest in this contest has reflected down through the entire organization, numerous prospects being turned over to local sales forces by employees in other departments. Everyone seems willing to "boost the boss' chance to go to Atlantic City."

And the net result from the company standpoint is greater gas sales per meter through increased appliance sales.

Current Expansion *in* Louisiana

(Continued from Page 62)

the year a new gas area was discovered in East Carroll Parish, which seems destined to assume major importance. Louisiana's potential gas reserves represent a capital asset to the nation, and as the years develop additional gas areas the value should become so apparent that it will demand the care and commensurate price to the producer in order to develop economic conservation.

The present scheme of often wasteful and improper production of natural gas cannot continue many more years, and the stabilizing influences of these pipeline networks will tend to preclude it.

The 1928 table of withdrawals (Table No. 1) shows a decided increase over previous years, some 22 per cent over 1927 in M. c. f.

Carbon black production for 1928 (Table No. 2) showed a slight increase in poundage over all previous years with the exception of 1924; meanwhile greater efficiencies have permitted a reduction in volume of gas consumed in the manufacture of the black.

It is to be hoped that economic forces can bring about an adequate yield of black sufficient to take care of the markets, from an ever decreasing M. c. f. of gas used. Percentages in the matter represent so small a figure as compared with the basic theoretical and yet possible yields from a cubic foot of gas.

The production of a normal increasing yield of black with a decreasing consumption of gas will help to hold the industry in Louisiana where it has attained considerable economic and industrial importance in the Monroe area. Legislative corrective measures can only disturb and perhaps destroy the very objects they are attempting to protect.

GLANCING AT THE FUTURE

It is difficult to estimate the full and far reaching effect which the introduction of straight gas fuel will have on the future growth and development of our American cities and rural communities. It is only necessary to reflect that the future tendencies will most certainly be toward the establishment of gaseous fuel throughout the States in a vast interconnecting system of pipe lines—the gas to be a composition of coal gas produced at the mines, natural gas from the wells, byproduct gases from many sources, at present little realized; that picture will stabilize the industry, and will provide comfort into the far corners of the land.

The effect will be startling. It will require salesmanship, and at the same time a comprehensive understanding of the obligation of our regulatory bodies to the public service.

NEW METHOD OF PIPE DIPPING EXPLAINED IN BULLETIN

Bulletin No. 272, recently issued by the Wales Dove-Hermiston Corporation, explains in detail and gives a complete layout of a new method of applying bitumastic enamel for the protection of services and other small diameter pipe.

Bitumastic Enamel, a product of this company, is usually spread on large size pipe by means of a brush, canvas sling or special rolling rig, and this bulletin explains the advantages of dipping small sized pipe directly into the molten enamel.

There follows a complete description of the equipment, which includes dipping vat or trough, melting kettle, tongs and handling racks. The booklet is available at any of the company's branch offices, the Pacific Coast district address being 345 Vermont St., San Francisco.

H-H INHALATOR IS NEW RESUSCITATION DEVICE

A resuscitation device particularly adapted to the use of the gas industry, called the H-H Inhalator, is featured in a pamphlet recently published by the Mine Safety Appliances Company. The inhalator is an adjunct to the prone pressure method of artificial respiration and is used in resuscitation of victims of carbon monoxide poisoning, gas asphyxia, electric shock, and drowning.

H. L. PONDER GETS FRANCHISE AT TUCKERMAN, ARK.

H. L. Ponder has been given a franchise to serve the town of Tuckerman, Arkansas, with natural gas.

Many of the 1,200,000 family meals cooked daily in the P G and E territory would be cooked easier and better if the ranges all had an Oven Heat Control.

That is why we're sending our customers the message reproduced in the newspaper advertisement pictured here.

Such messages, you know, help every merchant sell more high quality gas ranges.

After all, what is the most important thing in baking?

Modern Gas Ranges are built to insure perfect baking

Is it measuring and mixing ingredients? Is it selecting *certain* ingredients? All Home Economists know that after all, the most important thing is the correct oven temperature.

For almost anyone using care can measure and mix good ingredients accurately and follow a tested recipe. But in the baking—that's where all your best efforts meet the real test. Women have experienced this for long years.

Today, leading Home Economists are turning to a device that keeps the oven at any temperature. It is called the Oven Heat Control and is a part of the new Gas Range.

See these new Gas Ranges at your dealer's. Or phone or call at our office. We have a selected list of modern Gas Ranges that we recommend because we know they are good.

PACIFIC GAS AND ELECTRIC COMPANY

P·G·and E·

Owned · Operated · Managed
by Californians

105-129

PACIFIC GAS AND ELECTRIC COMPANY

P·G·and E·

Owned · Operated · Managed
by Californians

SAN FRANCISCO 245 Market Street

The Tapered Gas Pipe Line

It so happens that in girth welding by means of the new type weld the cost of girth welding is independent of the diameter of the pipe provided only that the metal is made thinner in proportion to the increased diameter. The cost of flanging the pipe and the cost of handling it in the field are each dependent almost entirely on the weight to be handled and that too is therefore independent of the diameter.

It is hardly suitable to make pipe as large as 40 inches in diameter of metal only three-sixteenths of an inch thick. For that reason the line will be deemed satisfactory if made 20 inches increasing to 30 inches diameter at the end of the 250 miles. The values of Table II, column 4, will then apply.

In the tapered line just described the increase in diameter of 10 inches per 250 miles means that each pipe length would be much less than one thousandth of an inch larger than the immediately preceding length. It would therefore be convenient and suitable to make the increase in diameter at intervals of 10 miles or even 25 miles. The diameter will increase in a series of steps.

EQUATION OF STEP LINE

If we divide the line into say five parts each 50 miles long and make the diameter of each 50 mile length 2.5 inches greater than the preceding 50 miles we shall find that this "telescope" line approximates the full tapered line.

In order to compare the quantities transmitted by the telescope line and the 20-30-inch tapered line, for the same pressures, we shall need to derive a general equation suitable for any number of steps.

Suppose the line whose total length is L miles is divided into n steps. The diameters of the successive steps will be d_1, d_2 ... d_n. Each interval of the line will be L/n miles in length. The diameters and pressures will be as indicated in Fig 5.

The increase in diameter at the end of each step will produce an exceedingly slight change in pressure. This slight change will be neglected and P_1 will therefore designate the pressure both at the end of the first step and the beginning of the second. This approximation will cause the calculated flow to be slightly less than the actual flow.

Writing Weymouth's equation for the separate steps we have

$$Q_s^2 = \frac{15385^2(P_o^2 - P_1^2)\,n\,d_1^{5\frac{1}{3}}}{G\,T\,L}$$

$$Q_s^2 = \frac{15385^2(P_1^2 - P_2^2)\,n\,d_2^{5\frac{1}{3}}}{G\,T\,L}$$

. . .

$$Q_s^2 = \frac{15385^2(P_{n-1}^2 - P_n^2)\,n\,d_n^{5\frac{1}{3}}}{G\,T\,L}$$

The right hand members of these equations are all equal. Successively eliminating P_1, P_2 etc. we obtain the final equation.

$$Q_s = 15385\left[\frac{n(P_o^2 - P_n^2)}{G\,T\,L\left(\frac{1}{d_1^{5\frac{1}{3}}} + \frac{1}{d_2^{5\frac{1}{3}}} + \cdots \frac{1}{d_n^{5\frac{1}{3}}}\right)}\right]^{\frac{1}{2}}$$

diameters are in inches.

n — number of intervals

P_o — initial pressure, lb/in² abs.

(*Continued from Page 71*)

P_n — final pressure, lb/in² abs.

L — total length in miles.

Q_s — cubic feet per day, 60° Fah, 14.67 lb/in²

For n equals infinity, this equation reduces to that of the tapered pipe line. For n = 1, and all diameters equal, it becomes Weymouth's equation.

Using this equation the gas flow through the 250 mile 20-30-inch line was calculated for the line as divided into various numbers of intervals.

In Fig. 6 the horizontal straight line at 101.6 millions daily indicates the flow through the full tapered 20-30-inch line from 400 pounds per square inch absolute initial pressure to 100 pounds per square inch absolute final pressure. The curve shows that as the number of intervals increases the gas flow approaches that of the tapered line. It is seen that it will be suitable to build the line with about 10 intervals each of 25 miles length.

Table No. 3 gives the quantities that will flow through a 250-mile n — step pipe line having the gas enter the 20-inch pipe at 400 pounds per square inch pressure. The quantities delivered at 100 pounds pressure (absolute) as calculated by equation (8) are shown in column four.

The curves of Fig. 6 indicate that more steps than ten are hardly necessary.

INTRODUCING ADDITIONAL GAS AT VARIOUS POINTS

Suppose we forsee the possibility that new gas fields may be discovered nearer the consumer than the original field, distant 250 miles. We shall need to examine the characteristics of both types of line to determine the effect on flow of adding enough new gas at say 50 miles or 100 miles from the source to bring the pressure in the line up to the maximum for which it was designed. For example, at 100 miles from the source the 20-30-inch tapered line will be 24 inches in diameter and the maximum pressure that may be utilized will be 277.8 pounds per square inch absolute. The introduction of sufficient new gas at this point to raise the pressure to this amount will be seen, Fig. 7, to produce a total flow of 116.6 million cubic feet daily. The increased flow is nearly the same for each of the two types of line. Table No. 4 gives the calculated values.

PRESSURE DROP ALONG TAPERED LINE

The curves of Fig. 8 show the pressures to which the 20-30-inch tapered pipe line will be subjected when transporting gas at various daily rates to a final pressure of 100 pounds per square inch.

The dotted curve shows the values of pressure the line was designed to withstand. The final pressure of 100 pounds is considerably less than the maximum permissible final pressure. It is seldom desirable to have a final pressure above 100 pounds.

The curves designated "50 millions" and "75 millions" show the reduced pressures all along the line that would be effected by restricting the flow at the source.

STORAGE CAPACITY OF TAPERED LINE

Casual consideration of the tapered pipe line indicates that for a given pressure its storage capacity will be greater than that of a cylindrical line, the initial diameters being identical. The maximum storage capacity will occur when all pressures have the maximum values for which the line was designed.

An elementary length dL of the tapered line, where the diameter is D feet, will contain dM pounds of gas where

$$dM = \frac{\pi D^2}{4}\rho\,dL$$

D — feet

L — feet

ρ — density, lb/ft³

$$\rho = \rho_s\frac{P}{R}$$

ρ_s — density at standard conditions, 60° Fah., 14.67 lb/in².

The quantity (reduced to standard conditions) stored in this elementary volume will be

$$dQ_{st} = \frac{\pi D^2 P}{4R}\,dL$$

Remembering the conditions of taper of the line:

$$D = D_1 + kL$$

and $$P = P_1\frac{D_1^2}{D^2}$$

$$dQ_{st} = \frac{\pi R D_1^2}{4kR}\int_{d_1}^{d_2} dD$$

Integrating, correcting for temperature and changing diameters to inches

$$Q_{st} = .01611\,\frac{P_1 d_1^2\,(d_2 - d_1)}{k\,T}$$

Q_{st}—capacity of line, ft³ at standard conditions.

d_1—initial diameter, inches

d_2—final diameter, inches

P_1—initial pressure, lb/in² abs.

T—flow temperature, deg. Fah. abs.

k—ratio increase in diameter to length

The 250-mile 20-30-inch tapered line transporting gas from an initial pressure of 400 pounds per square inch will therefore have a maximum storage capacity of 78.5 million cubic feet of gas. The actual quantity of gas in the line at any time will probably be quite less than this since the final pressure will never reach the maximum permitted by the thickness of the steel.

CONCLUSION

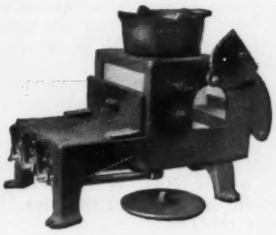
No attempt has been made to accurately estimate such costs as freight, field handling of the pipe, painting and ditching for the reason that such data could apply to only one particular project.

The most serious objection that may be offered to the use of the tapered gas transmission pipe line is that it may never be used to transport gas in the opposite direction.

It will occur to many that I have failed to mention or to consider the fact that the steel of the cylindrical line may be thinned as the pressure drops. That is true but at places where compressor stations are contemplated it must regain its full dimension. I hope I have also made it clear that the geometrical thinning of the steel of the tapered line is

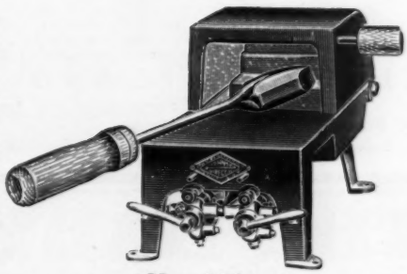
JOHNSON GAS APPLIANCES

are well in evidence wherever gas is used!



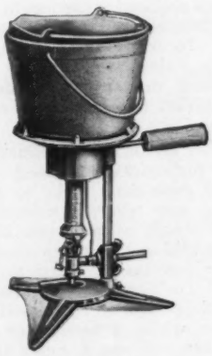
No. 118
Combination Bench Furnace

The name Johnson is synonymous with quality gas appliances. These products have won their way to recognition and appreciation by dint of sheer goodness. Wherever gas is used, you will see Johnson Burners, Torches, Soldering Furnaces, Melting Furnaces, and Heat-Treating Furnaces performing their respective duties in a dependable, efficient, and economical manner.

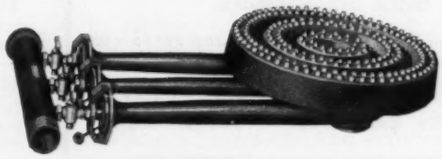


No. 101
Soldering Furnace

A free Catalog giving full details of our entire line is yours for the asking. We would be glad to receive your request.



No. 8
Torch and Melting Pot



No. 60 BCE
Ring Burners

No. 305
Melting Furnace

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA

Pacific Coast Representative:
C. B. Babcock Co.
135 Bluxome Street
San Francisco, Calif.

QUALITY GAS APPLIANCES

What's This Baby Digger Doing?

Digging Trench Where the Digging's Mighty Tough!

The Baby Digger shown in the illustration above is cutting trench out in a western state. It is delivering four feet per minute through a foot or more of frost and is shown here digging right through a small creek. "Mighty tough," is putting it mild.

That Baby Diggers have been able to deliver these most satisfactory results under such extreme conditions, is due to the fact that they are precision built of the finest steels in accordance with advanced engineering principles.

They have proven under many tests, that a trencher may be extremely compact, light in weight and mobile, yet powerful enough to meet the most severe tests of soil and adverse weather conditions.

You will find the Baby Digger a most usable piece of trench equipment, usable on more than 90 per cent of your jobs. Write for information immediately.

THE CLEVELAND TRENCHER CO.

"Pioneers of the Small Trencher"

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THE BABY DIGGER

Fire Brick Contractors

Established 1906

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Specializing in Gas Generator, Boiler, Still and Furnace Brick, Industrial Furnaces, Retorts, Kilns, Brick Smokestacks.

A capable Engineering Department competent to advise on any problem involving firebrick construction.

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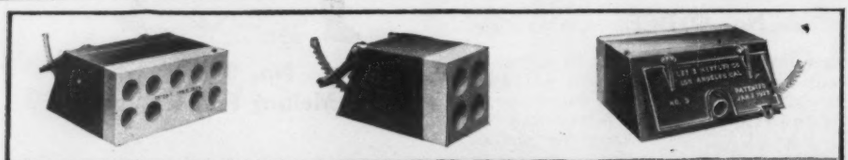


Mettler Entrained Combustion Gas Burners

FOR ALL Purposes Kinds of gas Pressures

406 S. Main St. **LEE B. METTLER. CO.** Los Angeles Cal.

not the maximum reduction of thickness that could be effected. Exact calculation of the steel tonnage involved in the two lines, based on actual pressures that will exist, is of interest only in connection with some particular project.

REFERENCES

1. Water Works Engineering, 81, p. 1075, July 1928; Municipal News and Water Works, 75, p. 45, July 1928; Jour. Am. Weld. Soc., 7, p. 7, July 1928; Western Gas, 4, p. 186, Sept. 1928; Hydraulic Engineering, 4, p. 561; Sept. 1928; Jour. Am. Water Works Assoc., 20, p. 449, Oct. 1928; Oil Field Engineering, Dec. 1928.
2. Oil and Gas Journal, 27, pp. 38, T-136, Aug. 2, 30, 1928.
3. T. R. Weymouth, Trans. A.S.M.E. 34, p. 185 (1912), or Natural Gas—Lichty, p. 376; Wiley and Sons.
4. Principles of Chemical Engineering—Walker, Lewis, McAdams, p. 75, McGraw-Hill Company.
5. Weymouth, loc. cit.

The Papico Orifice Meter Flange Assembly

(*Continued from Page 77*)

In this spreading arrangement all steel construction is used to insure against cracked or broken flanges. The pressure is brought to bear on the loose ring type flange and relegated to the pipe well behind the joint, which makes it practically impossible to throw the gasket faces out of parallel, even if the usual care of taking up evenly on the jack screws is not adhered to. There is no chance of straining or stripping a thread or causing a thread leak, for the Van Stone joint is an integral part of the pipe. There are no pipe threads.

BYPASSES

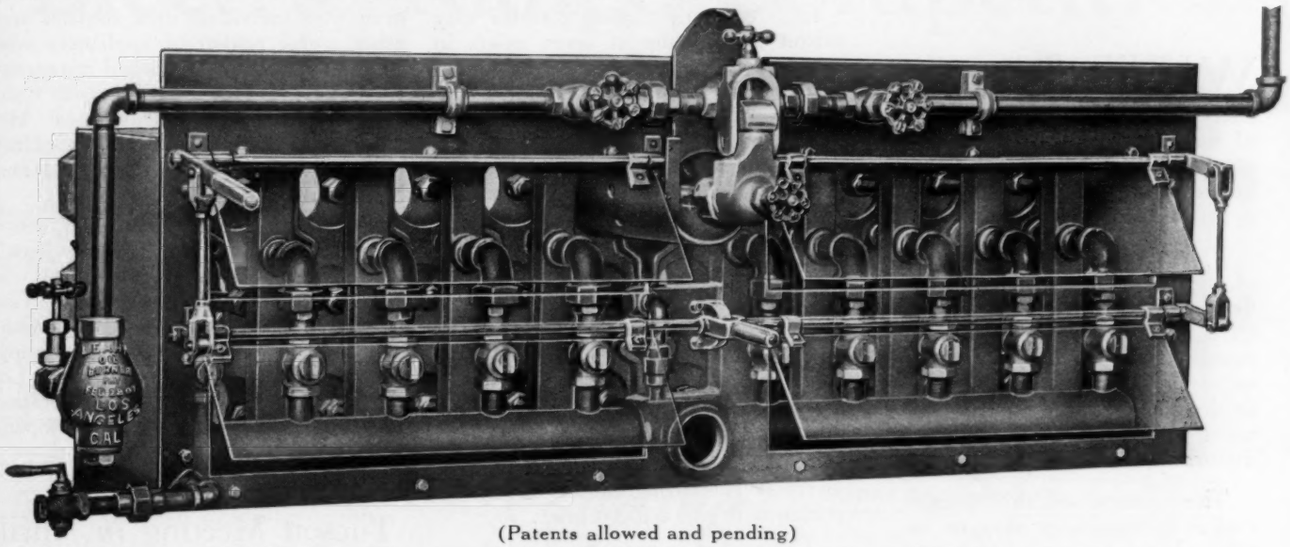
Now a word about bypasses: Naturally, they are necessary with the Papico flow meter if a continuous flow is to be maintained while plates are being changed. For inspection of the line to ascertain the conditions of the inside of the piping as to dirt incrustation or corrosion without a complete shut down, a bypass is a necessity. It is a well established practice to have the bypass of a much smaller pipe size than the meter run. In many installations the cost of the extra valves and pipe is negligible compared with the service rendered by a bypass in case of line trouble at or near the orifice plate.

During the laying of pipelines it is not uncommon for sticks of wood, pieces of clothing, tin cans and rocks to get inside. There was a case where a workman hid his shovel in a length of pipe one night. The next day he did not come to work and the shovel remained inside when the line was welded up. On another installation the pypass proved its worth by allowing a continuous flow while a section of the meter run was taken out and a roller skate which had lodged across the orifice, was removed. Some times it is possible to remove the orifice plate and blow whatever obstruction has lodged against it on down the pipe. This may relieve the condition which caused the inaccurate readings of this meter, but may cause more serious trouble beyond. With a flanged meter and a bypass, internal inspection is possible and trouble can be located and overcome without interrupting the continuous flow.

The extreme ends of the set-up are usually furnished beveled for welding, but can be threaded or Van Stoned to exact lengths if desired. Bolts for the central flange connection in the regular meter are furnished and extra heavy flanges are used. The meters are shipped in two sections with wooden protectors bolted across the finished laps for protection in shipping.

The Leahy Multi-Jet Unit

Is an Investment in Fuel Saving
that You Cannot Afford to Overlook



(Patents allowed and pending)

View Showing Combination Oil and Gas Unit.
Designed and Built for Burning
Low and **High** Pressure **Natural** or **Manufactured Gas** or
Oil only, or the **Combination** of **Gas** and **Oil**

Note the following outstanding advantages:

1—Self-contained portable combination unit.
2—Separate control valve to each row of gas burners.
3—Equal distribution of gases the entire width of combustion chamber.
4—All parts are individual and removable.
5—Individual burner tile for each gas burner.
6—Elimination of cracking and warping.
7—Designed to allow for expansion and contraction.
8—Oil burner piping always rigidly in place.
9—Oil burner can be inserted or removed instantly.
10—Independent pilot burner.
11—Adjustable draft doors.
12—All parts are air cooled.

To obtain maximum efficiencies and capacities from all types of high and low pressure steam boilers, stills, kilns, retorts, industrial furnaces, water heaters, bake ovens, kettles, etc.

CONSULT

LEAHY MFG COMPANY

1804-1810 East 8th Street *Established 1902* **Los Angeles, California**

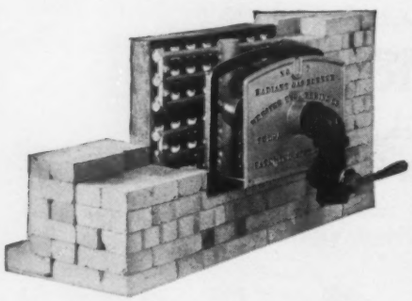
WEBSTER RADIANT GAS BURNERS
in the
NATURAL GAS FIELD

WEBSTER Radiant Gas Burners offer the simplest and most economical method of burning gas for the purpose of firing power and heating boilers, bake ovens, oil stills, gypsum kettles, brick kilns, etc.

They cover the widest range of capacity and provide great flexibility in operation. They burn the gas with maximum economy. They are available in sufficient range of sizes to fit the ash pit door openings of most standard boilers without disturbing the front.

The design of this burner makes it especially easy to install. It can be forced to heavy overloads, for emergency, without puffing or vibrating.

We are here to help you sell gas load—with advice, service and sales aid.



Typical installation Webster Radiant Gas Burners

See our exhibit at the Natural Gas Convention, Kansas City, May 6-9. Booth Nos. 210 and 211.

WEBSTER ENGINEERING COMPANY
Tulsa, Okla.
DIVISION OF
The Surface Combustion Co Inc.

Public Relations Section Convention Activities

(Continued from Page 73)

and segregate essays written by his organization and mail them not later than June 25 to Mr. Seaver. Essays must be in the hands of local contest directors not later than June 15.

Each company contest director may submit a minimum of seven essays in competition for the principal prize and a maximum of not more than 1 per cent of all the essays submitted by members of his organization. From these essays the final judges will select the winners. All other essays submitted will, however, be sent to the central contest committee and from among these a number will be drawn which will receive $5.00 prizes. The prizes offered are as follows: First prize—Trip to Del Monte Convention with all expenses paid; second prize, $50.00; third prize, $30.00; fourth prize, $20.00; next 10 prizes $10.00 each and a number of $5.00 prizes not yet determined, but tentatively set at $40. Everyone submitting an essay has an opportunity to win a $5.00 prize.

The contest is open to all employees of member companies of the Association with the exception of executives, and essays are not to exceed 1,000 words in length.

The complete rules are in the hands of local company directors who have been asked to broadcast them throughout their organizations.

Mrs. Creveling, chairman of the Women's Committee is acting with Mr. Seaver in an effort to encourage women to enter the contest.

Mrs. Creveling will also be active in connection with the Three-Minute Speaking Contest, as Mr. Holloway and Mr. Pollard are planning this year to have a separate contest among women employees.

The finals of both speaking contests will take place at luncheons during the progress of the Convention.

The subject for the Public Speaking Contest will be "Gas is Better" the same as that of the Essay Contest. Company directors will also be appointed to encourage elimination contests within each member company. The winner in each company elimination contest will receive a trip to the Convention and the winners in both the men's and the women's contests at the Convention will be presented with a handsome wrist watch.

Mr. Pollard will also have charge of the Public Relations Stunts program in competition for the Addison B. Day trophy.

Los Angeles Meeting *of* Commercial Section

(Continued from Page 72)

on several late hotel and restaurant appliances now being sold throughout Southern California. He mentioned in particular a new automatic gas toaster, a deep fat fryer, a recently developed bake oven with individual deck controls and other useful restaurant appliances now being offered to the hotel and restaurant trade. H. E. Davidson, Southern California Gas Company, discussed Mr. Leahy's paper and stressed the need for effective work with the restaurant and bakery trades.

During the course of the afternoon a meeting of Chairman C. M. Grow's Ordinance Committee was held in which representatives of the Pacific Gas and Electric Company, San Diego Consolidated Gas and Electric Company, Southern California Gas Company, Los Angeles Gas and Electric Corporation and Southern Counties Gas Company were present.

Tucson Meeting *in* April

(Continued from Page 73)

Sanders, second vice-president; and Lee McCullough, Phoenix, secretary and treasurer. The next convention of the Utilities Association will be held in Phoenix.

Among the Californians present at the Tucson meeting representing the gas industry, were Norman R. McKee of the Southern Counties Gas Company and Clyde H. Potter of the same company, Herbert Day and K. C. Tomlinson of the Pacific Meter Works, Frank C. Packer of the Welsbach Company, Ernest B. Hanmer of Geo. M. Clark & Company, W. H. Thompson of the Reliance Manufacturing Company, H. W. Jackson and Phil Jones of the Jas. Graham Manufacturing Company, J. A. Harritt and Ruth E. Creveling of the San Diego Consolidated Gas and Electric Company, E. H. Roseberry of the Sprague Meter Company, and Clifford Johnstone of the Pacific Coast Gas Association.

L. T. MOORE, OF ARKANSAS VALLEY GAS CO., DIES

Luther Thomas Moore, for 20 years an employee of the Arkansas Valley Gas Company died in Kansas City recently.

300 EMPLOYEES ENROLL FOR P. C. G. A. ESSAY CONTEST

About 300 employees of the Los Angeles Gas and Electric Corporation have already enrolled in the Pacific Coast Gas Association's essay contest.

Running Circles Around Electric Range Competition

That is a sizable order, isn't it? But it is being done by Gas Utility Stores in localities where the Utility Management and Chambers District Sales Managers are really hitting their stride.

We have the formula for selling gas ranges so as to build prestige as well as business for the gas company—so as to forestall the best efforts of the opposition.

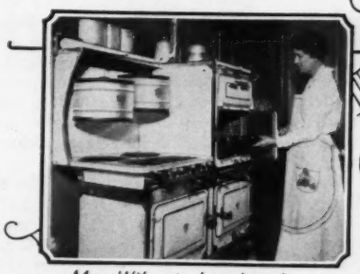
We manufacture the gas range that successfully meets electric competition and excels along the very lines of **their** strongest arguments.

We all know that your biggest task is to provide gas equipment so surpassingly fine and efficient that competition of other fuels will have no insurmountable allure.

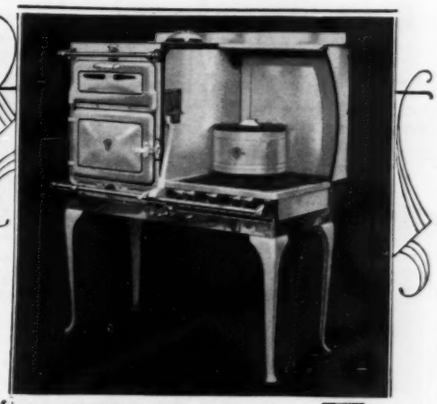
We also know that the electric industry is keenly alive to its opportunities and will run you a tough race. Their program is BIG and we admire them for their deep vision.

We admire them but we do not fear them.

All we seek is a chance to show you that together we can run those circles we spoke of, right in **your** locality.



Mrs. Wiley in her kitchen.



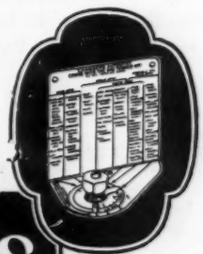
Adding a whole month of leisure

IN NATIONAL magazines, we are telling the women of America that the Chambers Gas Range gives them two hours a day more leisure. We are telling them that the Chambers Gas Range is striking the shackles of kitchen slavery off their wrists. This range lives up to these claims and we are winning by pointing out a more intelligent use of gas and suggesting improved cooking methods.

We are selling **the service** that our product renders and that is a much wiser thing to do than merely to exploit the product itself. The housewives of America want service and are willing to pay what it costs.

The CHAMBERS MANUFACTURING Company

31 Columbus Park
Shelbyville, Indiana



We are merchandisers as well as manufacturers and that must be the status of the Gas Company also. Write us when you are ready to discuss this matter personally.

Chambers
AUTOSTAT GAS RANGE

GAS or WATER Connections

whether screw thread or gasket, should be made up with KEY SPECIAL PIPE JOINT COMPOUND.

KEY SPECIAL PIPE JOINT COMPOUND is not a quick hardening cement, but a plastic lubricant and a filler that will seal the most obstinate joint with ease. It covers more surface than an equal volume of red or white lead, thereby reducing the cost. It is waterproof—and there is no waste.

Manufactured by

E. A. Key Co., Inc.

1431 Santa Fe Ave.
Los Angeles, Calif.

Distributors in all principal cities.

WRITE FOR FREE SAMPLE

PITTSBURGH VALVE, FOUNDRY & CONST. CO. ELECTS OFFICERS

Effective March 1st, new officers took over the management and operation of the Pittsburgh Valve, Foundry & Construction Company with headquarters in Pittsburgh, Pennsylvania.

The additions to the board are C. A. Anderson, Jr., long connected with the company as vice-president and sales manager, and who now becomes president and director of sales, and A. V. Wadsworth, formerly secretary-treasurer and manager of the Westcott Valve Company of East St. Louis, who becomes vice-president and general manager.

Mr. Anderson has been connected with the company in various capacities for over twenty years. He was for some time in charge of the New York office, later opening the office and establishing the company in Philadelphia. In 1922 he returned to the Pittsburgh office as general manager of sales, and since 1921 has been vice-president in charge of sales.

Mr. Wadsworth comes to Pittsburgh from the Westcott Valve Company. He has had experience in manufacturing for the oil and gas business principally, beginning in 1890 with the National Transit Company in Oil City, later with the Buckeye Traction Ditcher Company of Findlay.

Later he was connected with the Pomroy Machine Company at Pomroy, Ohio, in the manufacture of oil well supplies, which company was later absorbed by the Parkersburg Rig and Reel Company.

Going to the Westcott Valve Company shortly after the death of the late Henry Westcott, he helped build the new factory at East St. Louis and moved the equipment from Seneca Falls, N. Y.

Blake V. Fisher, for several years with Goulds Pumps, Inc., and for the last three years representing Westcott in Texas, will be district manager with offices in Dallas, Texas, and will have representatives in Tulsa, Shreveport, Houston, and New Orleans.

The eastern division will be in charge of W. H. Arnold, who has been connected with Pittsburgh Valve, Foundry & Construction Company for a period of years.

SUPER BROILER PAN IS NEW FEATURE ON ROPER RANGES

An improvement to the Geo. D. Roper Corporation's line of domestic gas ranges is announced, being the Super Broiler Pan. The new broiler pan consists of a baffle made of sheet steel, in the form of a drain, which carries away dripings from food being broiled on the broiler rack. The drippings are deposited on the broiler pan below, out of the reach of the oven burner flame.

This new feature is optional equipment on Roper domestic gas ranges and can be used in connection with the Self-Slide Broiler. The Super Broiler Pan will also fit broiling ovens in Roper ranges now in use.

Roper Super Broiler Pan is designed to prevent drippings catching fire and smoking, as the oven burner flame cannot reach the drippings which accumulate in the bottom of the broiler pan.

W. D. DICKEY ATTENDS MEETING OF AMERICAN METER CO.

W. D. Dickey, manager of the Pacific Meter Works, has just returned to San Francisco from attending the annual meeting of the directors and managers of the American Meter Company, held on April 15, in New York City.

J. LEO JOLLEY GETS PROMOTION WITH STAMFORD & WESTERN

J. Leo Jolley, associated with the Stamford & Western Gas Company of Stamford, Texas, since it was organized, as district manager of the merchandising department, has been appointed to the post of general manager of the company.

Mr. Jolley, before coming to the Stamford Gas Company of Stamford, Texas, was connected with the Detroit Stove Works, as manager of their Denver territory and the northwest. He became identified with gas company work in 1920 when he was employed by the Miami, Oklahoma, office of the Empire Companies. Mr. Jolley is president of the Exchange Club at Stamford and a director of the Chamber of Commerce.

W. B. FOSHAY CO. FEATURES TOWER IN BOOKLET

The W. B. Foshay Company of Minneapolis, Minnesota, upon completion of the Foshay Tower, issued a beautiful booklet celebrating that event. The brochure is artistically conceived and splendidly executed, giving a complete description of the new building.

THOMAS COOK ASKS FOR GAGE, OKLA., GAS FRANCHISE

Thomas Cook, representing the Keystone Pipe Company of Pittsburgh, Pennsylvania, has applied for a franchise for the service of natural gas to Gage, Oklahoma. The company owns gas wells in the Amarillo and Panhandle fields, and the gas would be supplied from one of them.

HAROLD W. JOHNSTON NAMED SUPT. AT INDEPENDENCE

Harold W. Johnston, superintendent of the Joplin Gas Company, has been made superintendent of the Jackson County Light Heat and Power Company at Independence, Missouri, under L. L. Garner. Ed. S. Larson will become superintendent of the Joplin company.

MONTANA WARM AIR HEATING CO. OPENS NEW OFFICE

The Montana Warm Air Heating Company, specializing in gas heating installations, has opened offices in Great Falls, Montana. The office will be under the charge of L. A. Persson and J. M. McFarlane. The firm is a member of the National Warm Air Heating Association.

UTILITY AND INDUSTRIAL CORP. IS NAME OF HOLDING CO.

H. M. Byllesby and Company announces the formation of a new investment company, which will be known as the Utility and Industrial Corporation, and will act as a holding company for H. M. Byllesby subsidiaries.

NATIONAL SAFETY COUNCIL TO HOLD CONFERENCE IN DALLAS

The National Safety Council will hold a regional conference in Dallas, Texas, on May 10. A. W. Breeland of the Lone Star Gas Company is chairman of the utilities group.

SPRINGFIELD GAS & ELEC. CO. MAY SERVE SPRINGFIELD, MO.

Request has been made by the Springfield Gas and Electric Company for a franchise to distribute natural gas in Springfield, Missouri.

SIZE

Makes no difference!

Sluice Gates and Gate Valves—All sizes and types for hand, hydraulic and electric operation.

Chapman Valves, ranging in size from 1/4 inch up to 60 inches, are playing a major part in the development and maintenance of the nation's gas transmission and distributing systems.

Gate valves up to 36 inch are carried in stock in all of the branch warehouses of the company located throughout the West.

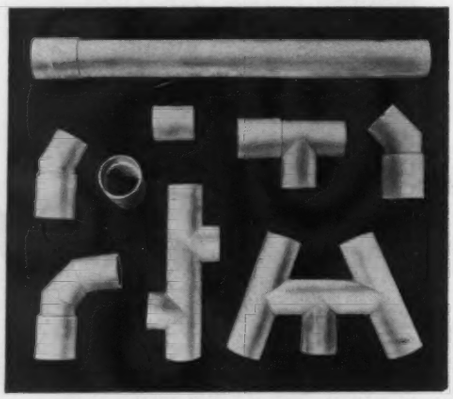
THE CHAPMAN VALVE MFG. COMPANY

Indian Orchard, Mass.

San Francisco **Los Angeles** **Tulsa** **Chicago** **New York**
Cleveland **Detroit** **Pittsburgh** **Philadelphia** **Boston**

VITEX

The Perfect Gas Vent and Flue Pipe



Solves the venting problem where no flue exists. Can be installed at low cost without foundation. Semi-vitrified, light in weight, absolutely non-corrosive and high in insulating value. Improves combustion by increasing draft.

Samples, prices and installation data gladly furnished on request.

PLANT

Rubber & Asbestos Works

537 Brannan Street **San Francisco, California**

California Oxide

GAS Purification Requirements can be most efficiently cared for through the additional and improved facilities of our new plant in Southgate.

Both Maas and McKee Oxides have met gas purification requirements of the Pacific Coast over a period of several years and merit your investigation.

California Oxide Co.

308 East Eighth Street
Los Angeles

TRinity 0769

W. J. MILLER NOW MANAGER OF GAS CONSUMERS ASS'N

Wm. J. Miller, formerly manager of Hot division of the Hot 'N Kold Corporation of San Francisco, California, is now manager of the Gas Consumers Association in Oakland and San Francisco.

The Gas Consumers Association has been in the business of leasing gas pressure regulators to large industrial and commercial users of gas for over fifty years and is now extending operations to include maintenance and care of gas appliances, and sale of automatic heaters, gas ranges, gas furnaces, etc. A new sales room has been opened in Oakland at 313 13th St., and it is expected that within three months another sales room will be opened in San Francisco.

M. A. HARDIE NOW VICE-PRES. OF DIXIE GULF GAS CO.

M. A. Hardie, vice-president and general manager of the Houston Gulf Gas Company, has been appointed to the additional position of vice-president of the Dixie Gulf Gas Company. Mr. Hardie will take charge of all properties of the Dixie Gulf Gas Company in Texas from Waskom southward. B. A. Hardy, vice-president of the Dixie Gulf Gas Company, who formerly had charge of the Texas territory, has been transferred to Shreveport, La., where he will look after the Louisiana Division. Mr. Hardy came to Houston less than a year ago from Shreveport.

CENTRAL ARIZONA L. & P. GETS TEMPE FRANCHISE

Central Arizona Light and Power Company has been granted a franchise by the utility commission for the purpose of serving Tempe, Arizona, with gas.

R. M. Redding

W. F. Wright

New Posts *for* W. F. Wright *and* R. M. Redding

WESLEY F. WRIGHT, formerly superintendent of the Dallas Gas Company has been appointed general manager of the Fort Worth Gas Company, and R. M. Redding in addition to his duties as engineer, has been made general superintendent of the Dallas Gas Company.

Mr. Wright came to Texas from Indiana 18 years ago following the admonition of a famous editor who advised young men to "go West and grow up with the country." He has spent all of these 18 years in the gas business, arriving in Texas about the time natural gas was discovered in that state. For the entire period he has been with the Dallas Gas Company and during the last two years has also worked with the Fort Worth Gas Company in addition to his duties in Dallas. Mr. Wright is 38 years old and is one of the youngest gas company managers in Texas.

A career ranging all the way from school teaching in Indiana to building and operating gas plants in Porto Rico has been that of Mr. Redding. He was born on a farm near Ft. Wayne, Indiana, graduated from Indiana University in 1904, specializing in chemistry, having worked his way through the university by teaching, starting with a country school at the age of 17 and ending in the science department of the Peru, Indiana, high school.

From 1905 to 1910 he was with the New Orleans Gas Light Company with the exception of one year when he was with the St. Paul Gas Light Company, St. Paul, Minnesota. He entered the New Orleans Company as cadet chemist and left is as assistant superintendent, going to Macon, Georgia, as general manager of the Macon Gas Light & Water Company.

Mr. Redding remained in Macon from 1909 to 1913, when he went to San Juan, Porto Rico, to complete the development of the Porto Rico Gas Company, introducing gas to a community which up to that time had used only charcoal as fuel for cooking. Some months after arrival he designed, built and put into operation a similar plant in Ponce, Porto Rico, a city of 35,000, which, as was the case of San Juan, knew only charcoal as a means of cooking. While in Porto Rico he served as general manager of both the Porto Rico Gas Company and the City of Ponce Gas Company and directed the activities of a construction company controlled by the same interests.

He left Porto Rico in 1917 to go with the U. S. War Department in the construction of a powder plant at Nitro, West Virginia, remaining with the War Department throughout the war.

Following his departure, the Porto Rico properties, feeling the depression caused by the war, went into receivership and he returned to take charge as receiver. He remained until 1922, rehabilitated the companies there, and then came to Dallas as engineer for the Dallas Gas Company which at that time was owned by the H. D. Walbridge Company.

Third Prize—*Western Gas* Salesmen's Competition

(*Continued from Page 81*)

now. They used to be the hardest days of all—heating water by kettlefuls on a blistering hot range—carrying heavy bucketfuls of water from sink to stove. What a difference the automatic gas water heater makes—*hot water,* lots of it, ready, flowing into tubs when you turn the faucet.

2. The Automatic Gas Water Heater Promotes *Health and Sanitation.*

Every housewife sets the health of her family above all other considerations. She realizes that hot water is a prime necessity in maintaining standards of personal cleanliness, as well as in performing routine household duties—for sterilizing, scouring, scalding, for clean homes, clean foods, and clean clothes. The wise housewife knows that even in the summertime *hot* showers and baths are recommended by physicians for health—instead of the usual (and dangerous) cold showers. So she grasps eagerly at anything that means greater sanitation and more healthful conditions for her family.

3. The Automatic Gas Water Heater Means a *Saving of Time and Money.*

Did you ever stop to think how much you pay for hot water in the course of a year—not only in dollars and cents, but in time and labor as well—the trips upstairs and downstairs—the long waits for water to heat up—coal consumed by the wasteful furnace coil—the makeshift supply from the teakettle—the inconvenience of "going without." The question is "How are *you* going to get hot water?" By all these, old-fashioned methods, with their wastes of time and money—or by the modern method of merely turning a tap—like many other folks who have learned they can "do it better with gas"?

Honorable Mention

JUSTIN MCMURRAY KENNEDY

Southern Counties Gas Company, Santa Monica, California

1. *DEPENDABILITY*:

What you are, no doubt, chiefly interested in, madam, is not just an efficient and attractive heater like this one, but 24-hour hot water service. Isn't that true? Once it is installed you want to be able to forget all about the heater itself, but be assured that you will always have an immediate flow of sparkling hot water at the turn of the faucet. No waiting, no delay—this heater is self-acting; truly a silent servant always at your command. Most important, though, it will eliminate the worry, the trouble of bothering with that worn-out tank.

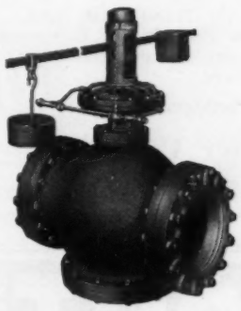
2. *BEAUTY AID*:

I can see, madam, that you are accustomed to the benefits of hot water service, so

A Differential Regulator

FOR MIXING GASES

CF



In the conservation of our natural gas by mixing with coke-oven gas this regulator is destined to have a place of importance.

Get The Details

The Chaplin-Fulton Mfg. Co.

Organized 1884—Oldest Builders of Gas Regulators in the Country. Built in all Sizes From 1 Inch to 24 Inches; For All Service. 1 oz. up to 1,600 lbs. Pressure to Square Inch.

28-40 Penn Avenue **Pittsburgh, Pa.**

REPRESENTATIVES:

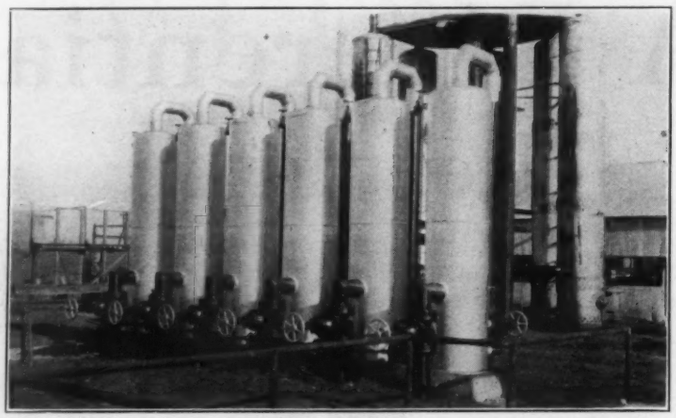
WESTCOTT & GREIS, Inc. Sales and Service — **JNO. W. CRAWFORD** Sales Engineer

Dallas — Los Angeles — Tulsa Or Any Jobber — **1855 Industrial Street Los Angeles**

From the Pacific Coast we send greetings to the Natural Gas Department of the American Gas Association, and to the officers and delegates in convention at Kansas City this month. May the deliberations of 1929 contribute in the same full measure as have those of previous years toward the technical advancement and the commercial upbuilding of this important branch of the gas industry.

C. B. BABCOCK CO.

San Francisco Los Angeles



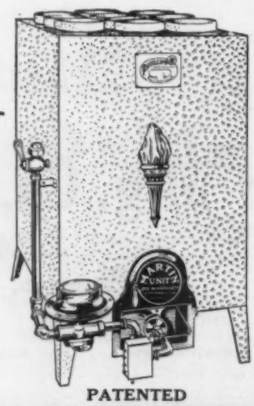
Battery of six 36" Acme Gas Cleaners Capacity 150 Million Per Day At 200 Pounds

Acme Gas Cleaners

Completely, Efficiently, Economically, Remove the *Finest Dust,* Sand, Water, Oil and Other Foreign Matter from Gas by Oil Contact Method. Used by the Largest Gas Companies. Recommended by Meter, Regulator and Compressor Manufacturers.

— Write Us About Your Dust Problems —

The Acme Gas Cleaner Co.
3406 Main St., Dallas, Texas



PATENTED

Martin Unit Gas Furnaces

ARE THE RESULT OF 38 YEARS HEATING EXPERIENCE
MADE IN FOUR SIZES
Electric, Thermostat or Manual Control
Approved by A. G. A. Laboratory and by the City of Los Angeles
Write for your copy of "Modern Heating Methods"
PHILLIPS HEATING, VENTILATING & MFG. CO.
1710 W. Washington St.
Los Angeles, California

Live Agents Wanted

TESTING LABORATORY A.G.A. APPROVED

SOUTH CHESTER STEEL PIPE

Excels for Gas Service

The unusual care given to accuracy of diameter and welding qualities, makes Chester Pipe a favorite for gas lines.

SOUTH CHESTER TUBE CO.
Chester, Pa.

naturally will better appreciate the unequaled convenience of always having a supply of clear hot water available as a beauty aid. Specialists tell us that the cleansing of the skin with warm water is a pre-requisite in achieving and maintaining the perfect complexion. With this heater in your home you will always have a plentiful supply of hot water for every personal need. In fact, you will find it as integral an aid in preparing your daily toilet as "Helena Rubinstein" or "Elizabeth Arden."

3. CONVENIENCE:

This heater will not only give you instant hot water, but also makes possible an ample supply at all times. In an emergency when the doctor requests hot water immediately, the delay and inconvenience of lighting up your old tank might be disastrous. Even when you are entertaining there will be an adequate supply for every demand. And it is embarrassing, isn't it, when an over-night guest is obliged to wait for hot water in order to shave or has the shower run cold? These unnecessary annoyances will vanish with the installation of this automatic and economic household convenience.

R. Z. Zimmermann Vice-Pres. *of* U. G. I. Co.

R. Z. ZIMMERMANN was elected vice-president of the United Gas Improvement Company in charge of purchasing, late in March. He succeeds J. A. Pearson, who resigned after 40 years of service.

R. Z. Zimmermann

The new official is a half-brother of John E. Zimmermann, president of the U. G. I. He is 35 years old and has had wide experience in the public utility industry, having been connected with Day & Zimmermann, Inc., since November, 1916. He will assume his new duties at once.

Mr. Zimmermann was born in Buenos Aires, Argentine Republic, in 1894. He was educated at Institute Libre de la Segunda Enseñanza, of that city, and at the University of Pennsylvania, from which he was graduated in mechanical engineering in 1916. That year he joined Day & Zimmermann, Inc., and with the organization has gained broad experience in the design, construction and management of gas, electric, electric interurban and street railway and bus line properties in Pennsylvania, Ohio, South Dakota and Nebraska.

In November, 1926, he was appointed assistant to the vice-president in charge of public utility management of Day & Zimmermann, Inc., and has been associated with The United Gas Improvement Company since 1927, when a controlling interest in Day & Zimmerman, Inc., was acquired by U. G. I.

SIERRA PACIFIC POWER CO. ORDERS MULTIPLE WASHER

The Sierra Pacific Power Company of Reno, Nevada, has ordered a multiple washer from the Semet-Solvay Engineering Corporation of New York. This washer will be used to remove tar and naphthalene from oil gas.

EMPIRE CO. EMPLOYEES RECEIVE DIVIDENDS, BONUS, INTEREST

Profit of more than $1,000,000 representing bonus, interest, dividend adjustment and market appreciation, has been delivered within the last few days to employees of the Empire Companies who completed their five-year subscription for Cities Service securities, begun in 1924.

Securities valued at $1,732,299 have been delivered to the employees who in 1924 subscribed to a total of $717,937.11—the $1,014,362.40 increase in value of the delivered securities representing a profit of 141 per cent, exclusive of the regular dividends and interest paid over the five year-period, to employees who completed the subscription contracts.

LONE STAR GAS COMPANY TO BEAUTIFY ITS PROPERTY

A program of beautification of plants and stations owned by the Lone Star Gas Company has been planned by J. A. Martin, superintendent of transportation and maintenance of the company. Ground will be leveled, shrubbery and flowers planted and fences constructed wherever desirable about such properties. The company now supplies more than 200 cities and towns in Texas and southern Oklahoma and maintains approximately 250 stations scattered over a territory larger than many entire states, with more than 3,200 miles of main pipeline and more than 250,000 domestic consumers.

NEW 73-MILE GAS PIPELINE TO SERVE MISSOURI TOWNS

A 73-mile natural gas pipeline to the Ash Grove Lime and Portland Cement Company's plant five miles southwest of Springfield, Missouri, from Saginaw will be built at a cost of approximately $1,200,000, according to an announcement made by officials of the Cities Service Gas Company, holder of the franchise for the line. From Saginaw, the line will connect with the company's main pipeline. Galloway will be the eastern terminus of the line, which will also serve Neosho, Monett, Pierce City, Crane and Marionville. Tentative plans include the service of West Plains and Poplar Bluff, Missouri.

PRATT, KANSAS, GRANTS FRANCHISE TO R. B. NEWBERN

Pratt, Kansas, may have natural gas from Watchhorn wells in Clark County. Franchise for the service of Pratt has been granted to R. B. Newbern, who assigned it to the Pratt Gas Company, of which he is an officer. The Pratt Gas Company has been granted a charter by the State Charter Board which authorized a $100,000 capitalization. R. B. Newbern, president of the Rice County Gas Company and secretary of the Wichison Gas Company; L. P. Newbern, W. H. Smith, and J. H. Magruder, are the incorporators of the company.

SKINNER COMPANY PUTS NEW CLAMP ON MARKET

The M. B. Skinner Company of South Bend, Indiana, is announcing a new Skinner Bell and Spigot Clamp, recently placed on the market. A feature of the new device which will be on exhibit at the Kansas City natural gas convention, is that the clamp seals its rubber gasket, of which several different compositions are offered, under constant compression to eliminate possibility of deterioration.

Greetings

to the

Natural Gas Department

American Gas Association

★

LOOKING BACKWARD . . .

. . . THINKING FORWARD

MUCH has been done by the natural gas industry through the years that have gone before us. Fortified with the confidence and knowledge of past accomplishments, we are building toward even greater achievement for the benefit of humankind.

As we assemble in convention to exchange opinions and experiences we are pressing on, shoulder to shoulder, to the goal of our ambition . . . Greater Public Service.

Lone Star GAS Co.

. . . PIPED FROM THE WELLS TO YOUR CITY

HOT-N-KOLD

The Hot-N-Kold Shops are now serving the public in eight cities in the northern part of California with Kelvinator Refrigeration, Holbrook Ranges, Welsbach Water Heaters, and other major appliances.

A valuable business franchise awaits the right dealer in every town.

HOT-N-KOLD CORPORATION

949 Mission Street San Francisco, California

EMPIRE Oil Meters

Positive Displacement Oscillating Piston Type

Simple in Construction—Easy to Operate—Low in Cost of Maintenance

EMPIRE meters are highly accurate, and **stay** accurate. They are invaluable for cracking and absorption processes; for gas companies; for refiners and distributors of gasoline and all distillates of petroleum; for measurement of crude oil, cold or hot.

ALL SIZES ⅝" TO 6"

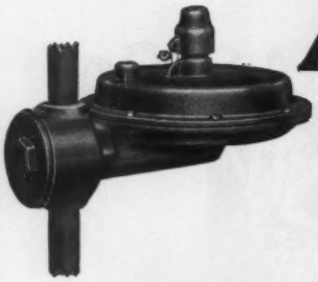
Standard meters will withstand working pressures of 150 lbs. to the square inch. High pressure types will handle 300 lbs. Higher pressures and special types to order.

National Meter Company

299 Broadway, New York

1048 Folsom Street, San Francisco **645 Santa Fe Avenue, Los Angeles**

MODEL 10 SERIES
With or Without Mercury Seal



Spring Type
Also furnished in Dead Weight Type

Reynolds Gas Control Since 1892

Products for all kinds of Pressure Reduction—for either artificial or natural gas.

GOVERNORS — Intermediate Pressure, Triple Outlet, Holder, Toggle Type Street.

REGULATORS—High Pressure Service, Low Pressure Service, High Pressure Line, Single and Double District Station.

VALVE—Automatic Quick Closing Anti Vacuum.

REYNOLDS GAS REGULATOR COMPANY
Anderson, Indiana

W P & S

DESIGNERS, FABRICATORS & ERECTORS OF PRODUCTS OF STEEL

Investigate WESTERN Hi-Pressure Unit Gas Holders

WESTERN PIPE & STEEL COMPANY OF CALIFORNIA
5717 Santa Fe Ave. LOS ANGELES — 444 Market Street SAN FRANCISCO
FACTORIES
LOS ANGELES · SOUTH SAN FRANCISCO · FRESNO · PHOENIX · TAFT

W P & S

JERRY STOVER IS COMMERCIAL MGR. FOR UTAH GAS AND COKE CO.

Utah Gas and Coke Company of Salt Lake City, Utah, has appointed Jerry Stover commercial manager for the company. Mr. Stover was formerly connected with the Lone Star Gas Company in Dallas, Texas.

The sales and appliances departments of the Utah Company have been enlarged under Mr. Stover's direction in anticipation of the heavy demands resulting from the introduction of natural gas into the Salt Lake valley this fall. A staff of house-heating and technical engineers are working under Mr. Stover's direction to help with heating problems encountered in the homes and industry.

HARRY MAYER IS REPORTED RECOVERING FROM PLEURISY

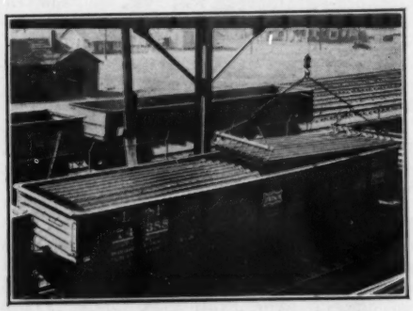
Harry Mayer, Southern California representative of the Tappan Stove Company, who has been seriously ill with pleurisy for the past five weeks, is reported recovering. Ray Wheeler, representing the Tappan Stove Company on the Pacific Coast, has been in Los Angeles to take care of Mr. Mayer's work.

HARVEY A. KEYS IS PROMOTED IN BYLLESBY ORGANIZATION

Harvey A. Keys has been appointed manager of the merchandise division of the Byllesby Engineering and Management Corporation, succeeding J. W. Devereaux. Mr. Devereaux becomes assistant to W. H. Hodge, vice-president and manager of the sales and advertising department in Chicago.

CONRAD, MONTANA, WILL HAVE NATURAL GAS THIS SUMMER

Preliminary work on the construction of a gas line to Conrad, Montana, from Shelby, has begun with a survey of the site for the line between the two cities. As soon as the survey is complete, actual construction will begin. Service is expected by early summer.



Section of the United States Cast Iron Pipe and Foundry Company's yards, showing 18-foot lengths of deLavaud pipe being loaded for shipment

DE LAVAUD PIPE TO BE MADE IN 18-FOOT LENGTHS

The United States Cast Iron Pipe and Foundry Company announces a departure in the company's manufacture of deLavaud cast iron pipe, which will hereafter be made in 18-foot lengths. The new length of pipe will be supplied in diameters of four to 12-inch, inclusive. The chief advantage in the use of the new pipe lenths is a 33-1/3 per cent reduction in the quantity of jointing materials, and in the labor of making the joints themselves and digging the bellholes. Equipment for handling the 18-foot lengths will be the same as that for 12-foot lengths.

WINCHESTER OIL AND GAS CO. SELLS OKLA., HOLDINGS

Winchester Oil and Gas Company, of Blackwell, Oklahoma, recently sold its natural gas franchise holdings in the towns of Gage, Fargo, and Shattuck, Oklahoma, to Reece McGee. Mr. McGee is negotiating with the Empire Companies to secure a gas supply from the Empire's 20-inch main gas line which traverses Ellis County, wherein the towns are located.

ARKANSAS NATURAL TO EXTEND SERVICES IN PINE BLUFF

Construction of a gas pipeline from Pine Bluff, Arkansas, to the new Arkansas Mechanical and Normal school for negroes, and to the Teony Airport, is now under project. Arkansas Natural Gas Company, distributor of natural gas in Pine Bluff, will lay the line, which will also serve the northwest part of the town, which has not as yet been piped for gas service.

ENGINEERING COMPANY ORGANIZES CANADIAN BRANCH

Dwight P. Robinson, president, United Engineers & Constructors, Inc., Philadelphia, has announced the formation of United Engineers & Constructors (Canada), Ltd., with headquarters in the Drummond Building, Montreal. The new company, of which R. M. Henderson is managing director, will execute engineering and construction work of any character in any part of Canada.

NEW BOOSTER STATION ON DENVER-TEXAS LINE

Work has started on the new $500,000 booster station on the Amarillo-Pueblo-Denver natural gas line to be erected near Model, 60 miles from La Junta, Colorado. The plant, which will furnish pressure for gas reaching Pueblo, La Junta, and Rocky Ford, will be completed by November 1, it is expected.

CONSTRUCTION OF ATOKA LINE TO START SOON

The Northwest Texas Gas Company will begin construction soon on the natural gas pipeline for the service of Atoka, Oklahoma, with gas. The nearest main gas pipeline from the Texas Panhandle fields to Atoka, is approximately 20 miles distant. It is expected that gas will be turned into the mains by early fall, according to press reports.

ROGERS, ARK., FRANCHISE GOES TO C. O. MOORE COMPANY

The C. O. Moore Company of Stamford, Texas, has been granted the natural gas franchise for Rogers, Arkansas, for a period of 25 years. Actual construction of the line was scheduled to begin within a period of 30 days from the granting of the franchise. Gas will be supplied from the Alma field.

ARKANSAS NATURAL GAS CORP. ASKS PERMIT AT WARREN

T. J. Compton and F. D. Shanks, representatives of the Arkansas Natural Gas Corporation have asked the city council of Warren, Arkansas for the right to serve that town with natural gas. Fordyce, Rison, Kingsland and Bearden, are now on the list of towns to be served by this company in the near future.

LAS ANIMAS, COLO., GRANTS FRANCHISE APRIL 2

Las Animas, Colorado, granted a franchise on April 2, to the Colorado Interstate Gas Company. Work on the new extension will begin shortly and it is expected to serve the town in the summer months.

If it's up to the Welder

it will be Victor Equipment

A list of the oil, gas and pipe line companies using Victor Equipment reads like a Who's Who of the gas industry.

And one reason is that the welders are all Victor enthusiasts. They know from experience. The torches are well balanced, the welder can work without tiring and in difficult positions.

The equipment is sturdy, no need to waste time on repairs. And it is safe to handle.

Day in and day out, more welds per operator is the unfailing record of Victor equipment.

Victor for Dependability and Economy

Victor Welding Equipment Company

844 Folsom Street San Francisco, California

NATURAL GAS IN PROSPECT FOR INDEPENDENCE, MO.

With the purchase by Cities Service Gas Company of the Jackson Light Heat and Power Company's distribution system, the Doherty Company plans to make a change over in that territory from manufactured to natural gas. This system serves gas to Independence, Missouri. The natural gas supply will come from the Sugar Creek line, constructed about a year ago.

ANACONDA COPPER MINING CO. INSTALLS NATURAL GAS UNIT

The Anaconda Copper Mining Company of Anaconda, Montana, has installed a natural gas unit. Gas for the plant is supplied by the Montana Cities Gas Company, the smelter consuming about nine million cubic feet daily.

LA JUNTA, SWINK AND ROCKY FORD LINES COMPLETE

Three Colorado towns will be added to those served by the Amarillo-Denver line. Work on the laying of pipeline is practically complete, and natural gas will be turned into the mains of La Junta, Swink and Rocky Ford as soon as a few minor details are completed. The Public Utilities Consolidated Corporation, a W. B. Foshay company, will distribute the gas.

NORTHWEST CITIES GAS CO. OPENS NEW OFFICE

The Northwest Cities Gas Company of Lewiston, Idaho, has opened offices in the Thiessen Building, and business is now being transacted at the new headquarters. Thomas L. Cross is manager for the company at Lewiston.

Gladding, McBean & Co.

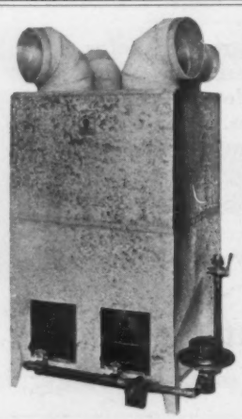
FIRE BRICK

Manufacturers of a Full Line of High Grade
REFRACTORIES
For Boiler Settings, Industrial Furnaces, Dutch Ovens, Etc.

SHAPE WORK A SPECIALTY

Also Fire Clay Chimney Pipe, Chimney Tops,
Flue Linings, Gas Flues.

Los Angeles	Oakland	Fresno	San Francisco
621 So. Hope St.	22nd and Market	(San Joaquin	445 Ninth St.
TRinity 5761	Oakland 0262	Materials Co.)	Douglas 0540



Furnace Service

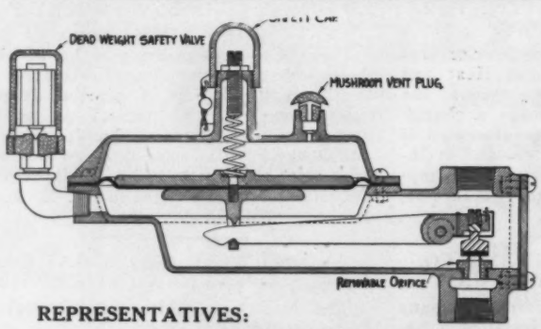
How much of your overhead is represented by unnecessary trips to your job?

In other words does your furnace or your service man render your service?

Install **Perfection Multiple Unit Furnaces** and cut down on your overhead.

L. H. Freymuth Jr

311 East Pico St., Los Angeles



PRESSURE REGULATION FOR ALL REQUIREMENTS

REPRESENTATIVES:
Seidenglanz & Co., Santa Fe Building, Dallas.
Midland Supply Co., Dwight Building, Kansas City.

GROBLE GAS REGULATOR COMPANY, Anderson, Ind.

PUEBLO GAS AND FUEL COMPANY IN IMPROVEMENT PROGRAM

The Pueblo Gas and Fuel Company has begun the laying of feeder lines to the Park Hill District of Pueblo, Colorado. Included in this project will be a gas regulator station, an 8-inch line for general service and a 6-inch industrial extension, according to A. M. Talbott, general manager of the company.

O. D. REDDING NOW WITH COLUMBUS VALVE CO.

O. D. Redding has been appointed sales manager for the Columbus Valve Manufacturing Corporation of Columbus, Ohio. Mr. Redding is well known in the gas industry, having been identified with the Lattimer-Stevens Company of Columbus for the past several years.

STATE FUEL SUPPLY COMPANY GETS ALEX, OKLA., FRANCHISE

Alex, Oklahoma, voted favorably on a proposition to grant a natural gas franchise to the State Fuel Supply Company. Actual operations are expected to begin within 90 days. Gas will be served to citizens of Alex by early fall.

BREMERTON, WASH., GIVES GAS PERMIT TO C. R. COLLINS

Work on the Bremerton, Washington, gas plant will start soon, following the granting of a franchise in that city to Charles R. Collins, Seattle operator.

PUBLIC SERVICE CO. OF COLO. MAY SERVE LITTLETON

The Public Service Company of Colorado was granted permission to exercise its franchise in Littleton, Colorado, early in April. Gas for the Littleton system will probably be available in a short time.

O. H. BONNER WANTS SEVERAL KANSAS GAS FRANCHISES

A project to bring natural gas to Ulysses, Lakin, Deerfield, Holly, and Granada, Kansas, is under way. O. H. Bonner of Denver, Colorado, has made application for the franchise to serve the territory included.

MEDICINE LODGE, KANSAS, GIVES BARBARA OIL CO. FRANCHISE

Barbara Oil Company has accepted a natural gas granchise granted by the city of Medicine Lodge, Kansas. Construction of the pipeline will begin within 90 days, according to the terms of the franchise.

ARIZONA EDISON CO. PLANS TO SERVE GAS TO SEVERAL TOWNS

The Arizona Edison Company has under consideration plans for the service of gas to the towns of Lower Miami, Claypool and surrounding districts, according to press reports late in April.

CREOLA CARBON AND GASOLINE CORP. TO BUILD PLANT

The Creola Carbon & Gasoline Corporation of Mangum, Louisiana, plans to erect a plant with a capacity of 8,000,000 cubic feet of gas daily on the Missouri Pacific Railroad at Mangum.

WINCHESTER OIL & GAS ASKS FOR TWO NEW FRANCHISES

Avard and Quinlan, Oklahoma, will hold elections in May on the application of the Winchester Oil and Gas Company for a franchise to serve natural gas to those towns.

'UNACCOUNTED-FOR GAS'

Comments about *Western Gas* from our readers, old and new.

"Best gas magazine by far on the market." *H. R. Edmonds,* manager, Black Hills Utilities Company, Belle Fourche, South Dakota.

"Western Gas is surely O. K. We all read it from cover to cover, and enjoy doing so."—*O. J. Duggins,* manager, Clayton Gas Company, Clayton, New Mexico.

"Think *Western Gas* so good that everyone connected with the industry should be a subscriber."—*H. B. Hinman,* merchandising manager, Public Utilities Consolidated Corporation, Nogales, Arizona.

"Western Gas is very helpful to the gas man."—*T. J. Crane,* gas engineer, Albia Light and Railway Company, Albia, Iowa.

"Your *Western Gas* has more than paid for itself, and I have only been on your mailing list four months."—*Gilbert Venne,* distribution department, Montana-Dakota Power Company, Valley City, North Dakota.

"Western Gas is carefully read by three or four of our staff each issue."—*W. P. Chisholm,* director, Mineral Division, Department of Conservation, Shreveport, La.

"Your magazine is very good. Very interesting and timely matters are covered."—*L. H. Stratford,* commercial manager, Public Utilities Consolidated Corporation, Pocatello, Idaho.

"Western Gas is a most interesting journal. Many instructive feature articles published in each issue."—*P. A. McCarthy,* chief engineer, West Texas Gas Company, Amarillo, Texas.

"Western Gas is O. K. It should reach everyone in the gas industry."—*John M. Burcham,* service and sales department, Blair Gas Company, Blair, Nebaska.

"More than worth the time and money to cover everything in each issue."—*C. A. Gates,* house-heating engineer, St. Joseph Gas Company, St. Joseph, Missouri.

"We secure considerable profitable material from this magazine."—*M. Barnert,* general superintendent, Northern States Power Company, St. Paul, Minnesota.

"Think so well of it have subscribed for three copies for friends of mine."—*Jos. C. Jordan,* general manager, Montana Cities Gas Company, Great Falls, Montana.

"I read *Western Gas* and like it. I think every dealer, salesman and service man should read *Western Gas."—G. A. Pratt,* new business manager, Public Service Company of Colorado, Boulder, Colorado.

"Western Gas is indeed a magazine that gives me the greatest pleasure in reading. I am satisfied, and more power to you."—*Sidney W. Allender,* Southern Counties Gas Company, Santa Ana, California.

"Very good pertaining to my position."—*P. A. White,* Dist. Supt. Oklahoma Natural Gas Co., Bristow, Okla.

Stockton Fire Brick Company

FIRE BRICK, INSULATING BRICK
HIGH TEMPERATURE CEMENT

High Grade Refractories
for

GENERATOR LININGS
CHECKERS
BOILER SETTINGS

OFFICE:
Russ Building,
San Francisco

WORKS:
Stockton,
California

The STRICKLER
Ratchet Pipe Cutter

The STRICKLER Ratchet Pipe Cutter automatically cuts cast iron, steel and wrought iron pipe (from 1½ to 30" in diameter) by hand (either in the trench or in the shop).

You can cut any pipe from any position easily. Simply pump the handle and the STRICKLER does the rest. Order your STRICKLER Now

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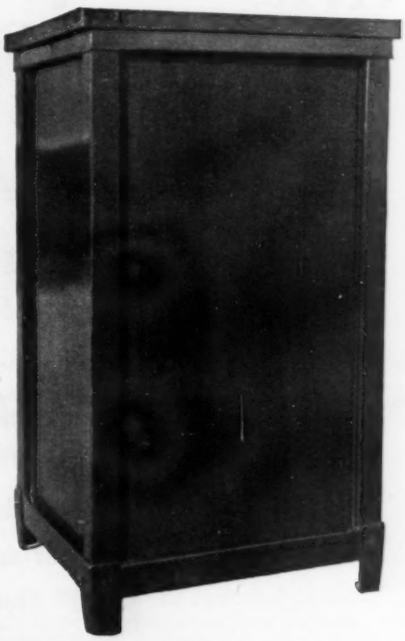
The Electrogas Cabinet



Will appeal to you because it is not only a rich piece of walnut furniture but is also a marvelously efficient gas furnace, fully vented.

ELECTROGAS FURNACE CO., San Francisco

GILFILLAN
Dual Control Valve Regulators

Write for literature

SAVE ONE INSTALLATION

Maintain a constant steam pressure on the boiler
and
Reduce and maintain an unvarying gas pressure to the burner regardless of the variation in line pressure.

Built to control Boiler pressure from one pound to 200 pounds steam, and deliver as low as two ounces gas pressure at the burner.

GILFILLAN MACHINE WORKS, Inc.
Ebenezer, Erie Co., N. Y.

Representatives
Jensen Instrument Co., 624 E. Fourth St., Los Angeles, Calif.
Gas Appliance Service Corp, 2014 Bryan St., Dallas, Texas.
The Diamond Supply Co., Charleston, W. Va.

The Magic Way Company

Gas Heating Devices

including

"Magic Way" Gas Furnaces
"Magic Way" Control Valves and Switches
"Potter" Radiators
"Steel Made" Radiators
"Cole" Floor and Wall Heaters
"Hall" Floor Furnaces

Manufactured by

Magic Way Company
National City San Diego California

LONE STAR GAS CO. HOLDS FIFTH SEMI-ANNUAL MEETING

The fifth semi-annual meeting of the foremen of the Lone Star Gas Company was held at the company's headquarters in Dallas, Texas, on April 12. About 125 foremen and superintendents from points in Oklahoma and Texas attended the conference.

F. L. Chase, vice-president of the company, and E. F. Schmidt, general superintendent, welcomed the men to the main office.

W. C. Grant spoke on "Our Relations with the Public"; A. W. Breeland on "The Foreman's Responsibility for Accidents"; J. R. Jarvis on the "Development of Star Gas"; R. A. Minter on "Maintenance and Operation of Plug Valves". J. H. Dunn reviewed the progress of the work the company has done on siphons and the new method of computing open flow. B. L. Rogers led an open discussion period during which problems facing the foremen were discussed. A. W. Breeland of the operating company presided. A banquet was given the men on the evening of the 12th.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC.,

Required by the Act of Congress of August 24, 1912, of *Western Gas*, published monthly at Los Angeles, California; for April 1, 1929.

State of California,
County of Los Angeles—ss.

Before me, a notary public in and for the State and county aforesaid, personally appeared Jay Jenkins, who, having been duly sworn according to law, deposes and says that he is the publisher of *Western Gas*, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher—Jay Jenkins, Los Angeles, Calif.
Editor—Geo. H. Finley, Los Angeles, Calif.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporatioon, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)
Western Business Papers, Inc., Los Angeles, Calif.
Jay E. Jenkins, Los Angeles, Calif.
James E. Jenkins, Los Angeles, Calif.
Geo. H. Finley, Los Angeles, Calif.
H. Elliott Taylor, San Francisco, Calif.
Craig Espy, Dallas, Texas.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)
None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

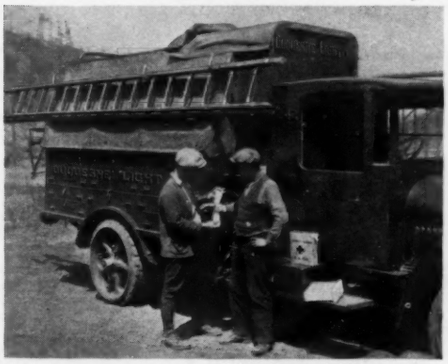
5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is..... (This information is required from daily publications only.)

JAY JENKINS, Publisher.

Sworn to and subscribed before me this 26th day of March, 1929.
(SEAL) JOSEPHINE C. WHITING,
Notary Public.
(My commission expires March 25, 1932.)

M-S-A *Waterproof* FIRST AID KITS

For Use on Trucks by Repair and Construction Crews



Duquesne Light Company, Pittsburgh, Pa.
Using M-S-A Waterproof Kit

M-S-A Waterproof First Aid Kits are built of 20-gauge steel to withstand rough usage. The contents, known as "Type D" Dressings, are put up in Unit Packages of Standard Size or Multiples of the Standard Size. The Unit Package arrangement permits interchangeability of contents to suit the requirements of the customer. These kits are available in 12, 16, 24 and 36 Unit Sizes. Ask for bulletin No. 36.

The 24-Unit Waterproof Kit with Inner Container Withdrawn and Opened

Safety First Pays!

Guard against infections and accidents in general . . . and thereby reduce insurance premiums. We would be glad to outline a plan for furnishing your entire safety requirements, including First Aid Materials, Gas Masks, H-H Inhalators, etc.

Write for Complete Information

Mine Safety Appliances Co.

Braddock, Thomas and Meade, Pittsburgh, Pa.

PACIFIC COAST BRANCH
318 East Third St., Los Angeles, Cal.

FISHER

. . . House Service Gas Regulators . . . a complete line . . . specialized in design and construction . . . write for NEW bulletin 7

Your special attention is called to the designs of FISHER specialized House Service Gas Regulators for strength to resist rough handling, neatness of appearance for ready sale, construction for satisfactory regulation, and other features permitting easy installation and maintenance.

The background of engineering talent and plant development behind FISHER *specialized* House Service Gas Regulators is truly the most outstanding in the industry today. They are *advanced in design—stronger in construction—more accurate in manufacture—mechanically correct*—and *MOST DEPENDABLE in service.*

The reasons for all of this are many—so many in fact that several pages are needed to cover all details—they are *so important, so valuable,* that YOU *should know about them*—Write for new Bulletin 7.

FISHER House Service Gas Regulators or Reducing Valves are built in two types. No. 206 (as illustrated), without Dead Weight Safety Valve; No. 205, with Mercury Seal Relief Valve; No. 208, with Dead Weight Safety Valve.

THE FISHER GOVERNOR CO.

2400 Fisher Bldg. **Marshalltown, Iowa**

A WESTERN GUIDE to INDUSTRIAL PURCHASING

Readers interested in any articles not listed in these pages are cordially invited to advise *Western Gas* of their wants and every effort will be made to furnish a list of the proper manufacturers. Addresses of companies listed on these pages may be found by consulting their advertisements in this issue.

Absorption and Compression Plant Equipment
Chaplin-Fulton Mfg. Co.
Jensen Instrument Co.
The E. A. Key Company
Western Pipe & Steel Co.

Absorption Towers
Western Pipe & Steel Co.

Adjustable Plugs
Western Pipe & Steel Co.

Agitators
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Aluminum Bronze Powder for Paint
Hill, Hubbell & Co.

Analyzers
Fort Worth Laboratories.
Smith-Emery Co.

Apparatus, Experimental Gas
The Bartlett Hayward Co.
Pacific Meter Works.

Appraisals and Valuations
Smith-Emery Co.
United Engineers & Constructors, Inc.

Bags, Gas Main
C. B. Babcock Co.
Mueller Co.
Safety Gas Main Stopper Co.

Barometers
The Bristol Company
Fort Worth Laboratories.
Jensen Instrument Co.
Westcott & Greis, Inc.

Bench Iron Work
The Bartlett Hayward Co.
General Gas Light Co.

Blocks and Tiles, Fire Clay
Gladding, McBean & Co.
Stockton Fire Brick Co.

Blowers and Boosters
Ingersoll-Rand Co.
Connersville Blower Co.
The P. H. & F. M. Roots Co.
United Engineers & Constructors, Inc.

Boiler Controls
The Cleveland Heater Co.
Gilfillan Machine Works, Inc.

Boiler—Brickwork
J. T. Thorpe & Son, Inc.

Boiler Equipment
E. A. Key Co.

Boiler Maker's Tools
E. A. Key Co.

Boilers, Gas-Fired
American Radiator Co.
C. B. Babcock Co.
Leahy Mfg. Co.

Boiler Settings, Pipe and Boiler Insulation
J. T. Thorpe & Son, Inc.

Boilers, Waste Heat
The Bartlett Hayward Co.
Phillips Heating, Ventilating & Mfg. Co.
United Engineers & Constructors, Inc.

Boilers, Water Tube
Western Pipe & Steel Co.

Breakers
Ingersoll-Rand Co.

Breeching (Boiler and Stack)
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Brick, Firebrick
Gladding, McBean & Co.
Stockton Fire Brick Co.
United Engineers & Constructors, Inc.

Brick, Firebrick—Installation
J. T. Thorpe & Son, Inc.

Brushes, Wire Pneumatic
Ingersoll-Rand Co.

Buildings, Steel
United Engineers & Constructors, Inc.
Western Pipe & Steel Co.

Bulletin Boards
Mine Safety Appliances Co.

Bunkers, Steel and Concrete
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Burners, High Pressure
Forney Combustion Engineering Co.
Leahy Mfg. Co.
Lee B. Mettler.
Rotary Manufacturing Co.

Burners, Low Pressure
C. B. Babcock Co.
The Bartlett Hayward Co.
Forney Combustion Engineering Co.
L. H. Freymuth
General Gas Light Co.
Johnson Gas Appliance Co.
Leahy Mfg. Co.
Lee B. Mettler.
Pacific Gas Radiator Co.
Payne Furnace & Supply Co.
Phillips Heating, Ventilating & Mfg. Co.
Rotary Manufacturing Co.
Western Pipe & Steel Co.

Burners—Oil
Forney Combustion Engineering Co.
Leahy Mfg. Co.
Rotary Manufacturing Co.

By-Product Recovery Apparatus
The Bartlett Hayward Co.

Calorimeter Accessories
Fort Worth Laboratories.
Pacific Meter Works.
United Engineers & Constructors, Inc.

Carbon Monoxide Detector
Mine Safety Appliances Co.

Carbon Monoxide Masks
Mine Safety Appliances Co.

Carbon Monoxide Recorders
Mine Safety Appliances Co.

Cases, Meter
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Casinghead, Gas Meters
The Bristol Company
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.

Casing and Tubing (steel)
South Chester Tube Co.

Casing—Iron
South Chester Tube Company

Cast Iron Pipe
James B. Clow & Sons
United States Cast Iron Pipe and Foundry Co.

Castings
The Bartlett Hayward Co.
United States Cast Iron Pipe and Foundry Co.

Cement
Stockton Fire Brick Co.

Cement, High Temperature
Stockton Fire Brick Co.

Centrifugal Pipe
James B. Clow & Sons
United States Cast Iron Pipe and Foundry Co.

Charging Machines (retort, etc.)
The Bartlett Hayward Co.

Checker Brick
Gladding, McBean & Co.
Stockton Fire Brick Co.

Chemical and Gas Testing Apparatus
Fort Worth Laboratories.
Pacific Meter Works.
Stauffer Chemical Co.
United Engineers & Constructors, Inc.
Westcott & Greis, Inc.

Chemists, Analytical
Fort Worth Laboratories.
Smith-Emery Co.

Chimneys, Radial Brick
Gladding, McBean & Co.
Stockton Fire Brick Co.

Chimneys, Radial Brick Installation
J. T. Thorpe & Son, Inc.

Chutes (coal, coke, ash)
The Bartlett Hayward Co.
United States Cast Iron Pipe and Foundry Co.

Clamps and Sleeves, Pipe
S. R. Dresser Mfg. Co.
Mueller Co.

Clamps, Service
Mueller Co.

Cleaners, Service
C. B. Babcock Co.
Pacific Meter Works.

Coal Gas Plants
Charles R. Collins.
The Bartlett Hayward Co.

Cocks
A-B Stove Company
C. B. Babcock Co.
Johnson Gas Appliance Co.
Leahy Mfg. Co.
Merco Nordstrom Valve Co.
Mueller Co.
Geo. D. Roper Corporation.

Collectors, Dust
Western Pipe & Steel Co.

Compressors, Air
Ingersoll-Rand Co.
Leahy Mfg. Co.

Compressors, Gas
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Compressors, High Pressure
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Compressors, Portable
Ingersoll-Rand Co.

Condensers
The Bartlett Hayward Co.
Ingersoll-Rand Co.

Controllers
The Bristol Company
Fort Worth Laboratories.
Jensen Instrument Co.
The Foxboro Co., Inc.
Robertshaw Thermostat Co.

Controls, Air and Steam
The Bartlett Hayward Co.
The Bristol Company
The Foxboro Co., Inc.
Jensen Instrument Co.

Cooling Systems
The Bartlett Hayward Co.

Cooling Towers
J. B. Gill Corporation.

Counters, Revolution
The Bristol Company
Fort Worth Laboratories.
Jensen Instrument Co.

Couplings
S. R. Dresser Mfg. Co.
The Bartlett Hayward Co.

Couplings—Flexible Rope & Spider Arm
The P. H. & F. M. Roots Co.

Coverings (Flat and Corrugated)
L. H. Freymuth

Cubic Foot Bottle
Pacific Meter Works.

Cutters, Pavement
Ingersoll-Rand Co.

Cylinders, Compressors
The C. & G. Cooper Co.

Danger Signals
Safety Gas Main Stopper Co.

Dephlegmaters
Western Pipe & Steel Co.

Diaphragms, Meter
Chaplin-Fulton Mfg. Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Diggers, Clay
Ingersoll-Rand Co.

Discharging Machines (retort, etc.)
The Bartlett Hayward Co.

Drills
Ingersoll-Rand Co.
Mueller Co.

Drill Pipe—Iron
South Chester Tube Company

Drill Pipe—Steel
South Chester Tube Company

Dryers—Laundry
W. E. Lamneck Co.

Engineers and Engineering Service
Charles R. Collins.
J. B. Gill Corporation.
The Bartlett Hayward Co.
Smith-Emery Co.
United Engineers & Constructors, Inc.
Western Pipe & Steel Co.

Engines, Diesel
The C. & G. Cooper Co.

Engines, Gas
The C. & G. Cooper Co.
Ingersoll-Rand Co.
United Engineers & Constructors, Inc.

Engines, Oil
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Engines, Steam
Ingersoll-Rand Co.

Evaporating Apparatus
The Bartlett Hayward Co.
United States Cast Iron Pipe and Foundry Co.

Excavators, Ditch and Trench
The Cleveland Trencher Co.

Exchangers, Heat
Western Pipe & Steel Co.

Exhausters
Connersville Blower Co.
Ingersoll-Rand Co.
United Engineers & Constructors, Inc.
United States Cast Iron Pipe and Foundry Co.
The P. H. & F. M. Roots Co.

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The Bartlett Hayward Co.
Pacific Meter Works.

Filters
United States Cast Iron Pipe and Foundry Co.

Fire Clay and Products
Gladding, McBean & Co.
Stockton Fire Brick Co.

Fire Brick Contractors
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First Aid Supplies
Mine Safety Appliances Co.

Fittings
The Bartlett Hayward Co.
James B. Clow & Sons
United States Cast Iron Pipe and Foundry Co.

Fixtures, Lighting (Domes, Portables, etc.)
C. B. Babcock Co.
Welsbach Company.

Fire Brick
Gladding, McBean & Co.
Stockton Fire Brick Co.

Flanges
Pittsburgh Equitable Meter Co
Westcott & Greis, Inc.

Forgings
Payne Furnace & Supply Co.
Geo. D. Roper Corporation.
J. T. Thorpe & Son, Inc.

Furnaces, Floor
Electrogas Furnace Co.
Magic Way Company
Pacific Gas Radiator Co.
Payne Furnace & Supply Co.

Furnaces, Heating
James B. Clow & Sons
The Estate Stove Co.
L. H. Freymuth
Payne Furnace & Supply Co.
Magic Way Company.
Pacific Gas Radiator Co.
Phillips Heating, Ventilating & Mfg. Co.

Furnaces, Industrial
C. B. Babcock Co.
Johnson Gas Appliance Co.
Leahy Mfg. Co.
Mueller Co.
Payne Furnace & Supply Co.

Gas Analysis Apparatus
The Foxboro Co., Inc.
Fort Worth Laboratories.
Jensen Instrument Co.
Mine Safety Appliances Co.
Pacific Meter Works.
United Engineers & Constructors, Inc.

Gas Indicators
Mine Safety Appliances Co.

Gas Masks
Mine Safety Appliances Co.
Safety Gas Main Stopper Co.

Gas Main Tapping & Drilling Machines
Mueller Co.

Gaskets
The E. A. Key Company
Pittsburgh Equitable Meter Co
Safety Gas Main Stopper Co.

Gasket Compound
E. A. Key Co.

Gas Pipe Line Construction
Western Pipe & Steel Co.

Gates—Wind & Blast
The P. H. & F. M. Roots Co.

Gauges
The Bristol Company
Fort Worth Laboratories.
The Foxboro Co., Inc.
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Westcott & Gries, Inc.

Gauges, Steam
The Bristol Company
Jensen Instrument Co.
The Foxboro Co., Inc.
Westcott & Gries, Inc.

For an Increased Load Sell New Appliances

Gas companies are in business to sell gas. And to sell **more** gas they must educate their subscribers to use new, efficient and economical gas appliances—particularly those which do not require larger pipe, larger meters or extra servicing of any kind. That is why more than 300 of the most progressive gas companies are now selling

The LAMNECK LAUNDRY DRYER

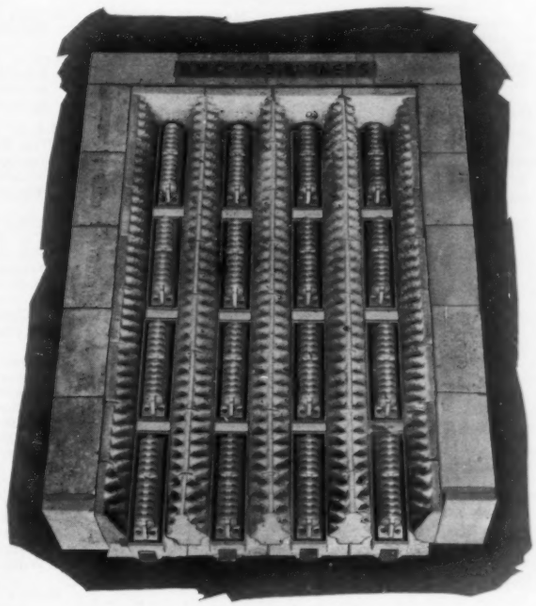
They **know** the Lamneck solves washday's biggest problem by drying **all** the clothes perfectly—on **every** washday. They know every owner of a power washer is a potential Lamneck buyer. And they have proved, for themselves, that the Lamneck keeps the washing at home—indirectly boosting the load of washer, ironer and water heater.

The Lamneck has thermostatic temperature control, indirect heating, stainless-metal hanging rods, and it is finished, inside and out, with two colors of heat-treated enamel.

We'll be glad to send you details.

The W. E. Lamneck Company
443 Dublin Avenue
Columbus, Ohio

The Lamneck makes every day a "good-drying" day.



The above cut illustrates an arrangement of 16 R. M. C. Gas Burners set in R. M. C. Radiant Tile.

The R. M. C. Gas Burner operates on a new principle. Combustion is complete at all gas pressures. Although it requires no shutters, mixing valves, or other mechanical air regulating devices the primary air is always supplied in the proper proportion required for complete combustion. It produces a snappy, high temperature flame.

The R.M. C. Radiant Tile setting provides a means of more effectively transmitting to the heating surfaces, by radiation, the high temperatures produced by the R. M. C. Gas Burners.

Its conical projections not only increase its radiating surface but assist in mixing the secondary air, which enters between the tile and the burners, with the mixture of gas and primary air issuing from the burner heads. These conical projections become incandescent when the burners are in operation.

The tile are made in short sections and can be readily arranged to accommodate any number of burners.

Additional information will be cheerfully furnished on request.

ROTARY MANUFACTURING COMPANY
5720 Long Beach Ave. **Los Angeles, Calif.**

Gauges, U Type
C. B. Babcock Co.
The Bristol Company
Fort Worth Laboratories.
Jensen Instrument Co.
Lee B. Mettler.
Pacific Meter Works.
Safety Gas Main Stopper Co.
The Foxboro Co., Inc.
Westcott & Gries, Inc.

Generators, Water Gas
The Bartlett Hayward Co.

Glassware
Fort Worth Laboratories.
Westcott & Gries, Inc.

Gloves, Industrial
Mine Safety Appliances Co.

Goggles
Mine Safety Appliances Co.

Governors
C. B. Babcock Co.
Chaplin-Fulton Mfg. Co.
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Reynolds Gas Regulator Co
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Hammers
Ingersoll-Rand Co.

Hanger, Meter
Mueller Co.

Heaters
American Radiator Co.
C. B. Babcock Co.
James B. Clow & Sons
The Estate Stove Co.
L. H. Freymuth
General Gas Light Co.
Magic Way Company.
Moore Brothers Company
Payne Furnace & Supply Co.
Phillips Heating, Ventilating & Mfg. Co.
Welsbach Company.

Heaters, Floor
General Gas Light Co.
Magic Way Company.
Pacific Gas Radiator Co.
Payne Furnace & Supply Co.

Heaters, Wall
C. B. Babcock Co.
General Gas Light Co.
Magic Way Company.
Pacific Gas Radiator Co.
Payne Furnace & Supply Co.

Heat Exchangers
Western Pipe & Steel Co.

Heat Interchangers
Western Pipe & Steel Co.

Hoists
Ingersoll-Rand Co.

Holders
The Bartlett Hayward Co.
United Engineers & Constructors, Inc.

Holders, High Pressure
Western Pipe & Steel Co.

Hoppers
The Bartlett Hayward Co.

Hose, Air
Ingersoll-Rand Co.

Hot Plates
A-B Stove Company
C. B. Babcock Co.
Johnson Gas Appliance Co.
Geo. D. Roper Corporation.

Hygrometers
The Bristol Company
Fort Worth Laboratories.
Jensen Instrument Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Incinerators
C. B. Babcock Co.
J. T. Thorpe & Son, Inc.
Western Pipe & Steel Co.

Incinerator Brickwork
J. T. Thorpe & Son, Inc.

Indicators
United Engineers & Constructors, Inc.
Westcott & Greis, Inc.

Inhalators, H-H
Mine Safety Appliances Co.

Instruments (Measuring, Testing and Recording)
The Bristol Company
Fort Worth Laboratories.
Jensen Instrument Co.
Pacific Meter Works.
The Foxboro Co., Inc.
United Engineers & Constructors, Inc.
Westcott & Gries, Inc.

Insulating Materials
L. H. Freymuth
Stockton Fire Brick Co.

Joint Runners Asbestos
Safety Gas Main Stopper Co.
United Engineers & Constructors, Inc.

Kilns
J. T. Thorpe & Son, Inc.
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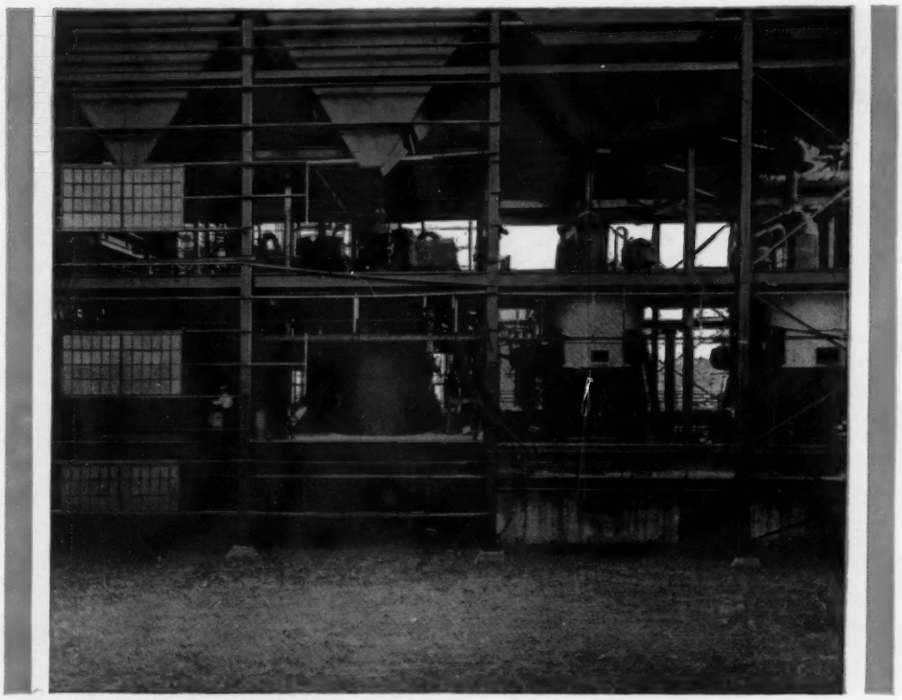

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